

FRONT RANK
TRADE NAME REGISTERED

FURNACES

LANGENBERG MANUFACTURING CO.
SAINT LOUIS, U.S.A.

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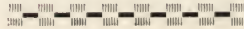


FRONT RANK
TRADE NAME REGISTERED

DURABLE — ECONOMICAL
STEEL FURNACES



CATALOGUE NO. 17



*Warm Air Heat is
Best For Every Home*

APPROVED BY



TRADE-MARK

ESTABLISHED 1888

MADE BY

LANGENBERG
MANUFACTURING CO.

4519-33 EUCLID AVE.

ST. LOUIS, U. S. A.



REGISTERED TRADE-MARK

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A Chat With Dealers

*The FRONT RANK is a Durable-Economical
Steel Furnace*

THE quality of any article depends on the raw materials of which it is made; the workmanship used; and the policy of the company which makes it.

The FRONT RANK Furnace is made of Keystone Copper Steel and semi-steel castings; it is lined with Missouri Fire Clay tiles; and it is mounted with Pecora Cement—materials known as “standard” by all furnace men.

After thorough tests of the various grades of steel on the market, we have become convinced that the “Keystone Copper Steel” is the most *durable* for furnace work, and all of the boiler work on the FRONT RANK is of this brand of open hearth blue annealed steel.

The castings used on the “FRONT RANK” are made in our own foundry. Every heat is subjected to the most rigid inspection and analysis so that the correct proportions of the various elements making for good castings are contained in each and every casting. In addition to this, one of the foremost chemists in this city—a man not connected in any way with this organization—makes independent tests to check against our own.

Nothing is left to chance. Every part of every “FRONT RANK” Furnace must be of the highest quality before it is sent to the assembling department.

Skilled workmen—most of whom have been with our organization for years—work this excellent raw material into the “FRONT RANK” Furnace. Then a thorough inspection of the finished product is made before it is passed to the Shipping Department to be sent out to our Dealers.

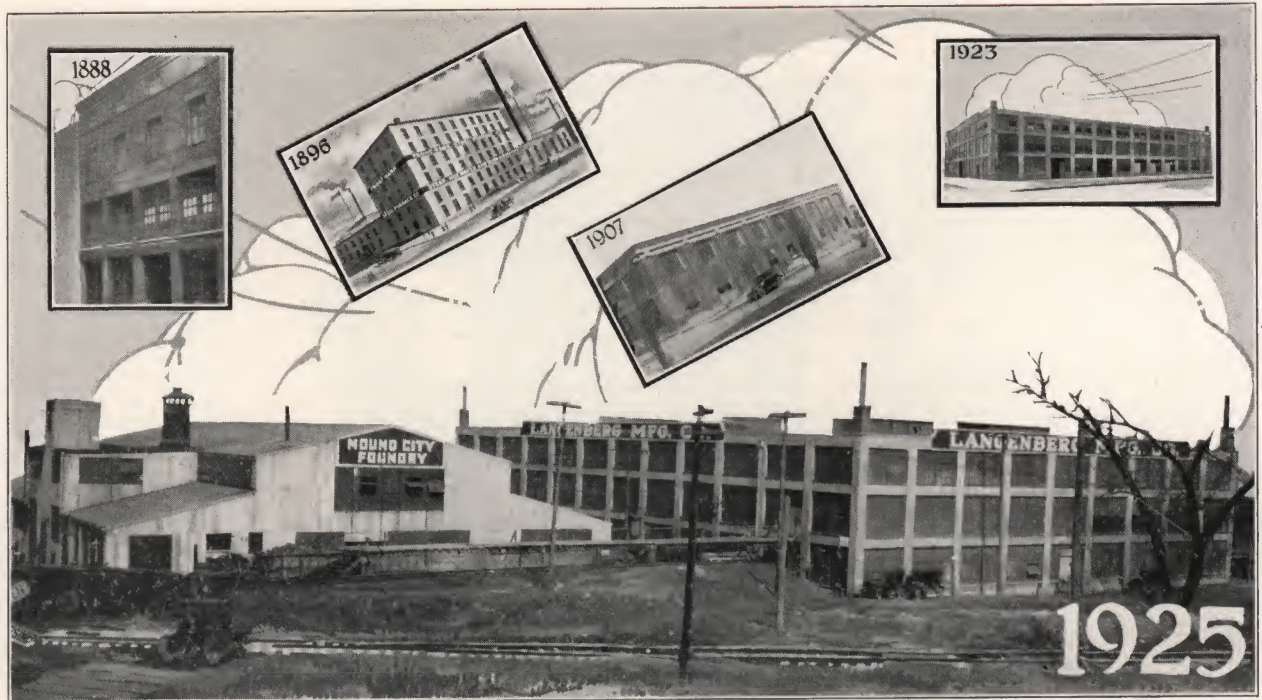
Our policy has always been to make a furnace of simple construction with no complicated parts to get out of order, and yet of such a design that the fuel can be *economically* used. We believe we have succeeded. The steady increase in our sales since the first “FRONT RANK” was manufactured back in 1888, and the number of dealers who have been selling “FRONT RANKS” for years and years, satisfies us that we are making a furnace which appeals favorably to the Home Owner, and to the Dealer who serves him.

We solicit your continued good will.

Geo F Lungenborg

President.

A Picture Story of 38 Years of Progress



From one room in 1888, where the furnaces were made by hand, through three larger plants occupied in 1896, 1907 and 1923, down to our complete group of buildings just finished, measures a progress of which we are justly proud.

The main building is of reinforced concrete, three stories high, equipped with the most modern labor saving machinery for use in manufacturing "FRONT RANK" furnaces.

The foundry building is of fireproof construction, and is equipped with moulding machines, electric and pneumatic cranes for handling flasks and iron, special machines for recovering the usable materials from the cupola refuse, etc.

Our private switch, located on the Terminal Railroad, insures the prompt loading of carload freight, which can be routed via any railroad giving the best service to the particular destination.

We also own sufficient land surrounding our plant to allow for future expansion, which we anticipate will be as steady in the future as it has been in the past.

If You Want a First Quality Warm Air Heating System

Roughly there are two kinds of air heating furnaces.

The warm air furnace, made to give satisfaction to the user, and where health and real comfort are the chief considerations.

The "hot air" furnace, made cheap to sell cheap, first cost being the only consideration.

The "FRONT RANK" is a warm air furnace of the first quality.

We need only say "hot air furnace" and pass.

A first quality warm air furnace must, we believe, have these good points, and the prospective buyer is justified in demanding proof of them, such as we propose to furnish in the following pages:

1. The furnace must be permanently gas tight and smoke proof.
2. It must be economical in the use of fuel.
3. It must be simple to operate.
4. It must be built of materials that will practically make repairs unnecessary.
5. It must be properly engineered, both in the making and in the installing.
6. As long as the furnace is in use every room having a separate run must be comfortable.
7. The company manufacturing it, must be financially able to back up its guarantee of quality; such a company has a good name to protect and does it.

The dealer who is convinced that his furnace will measure up to these seven points of quality will display a confidence in talking to his prospective customers which will in turn convince them.

The number of "FRONT RANK" dealers who are using the furnace in their own homes is a convincing proof that our dealers are selling what they believe in.



Series "1"

FRONT RANK Steel Furnace with Casing Cut Away

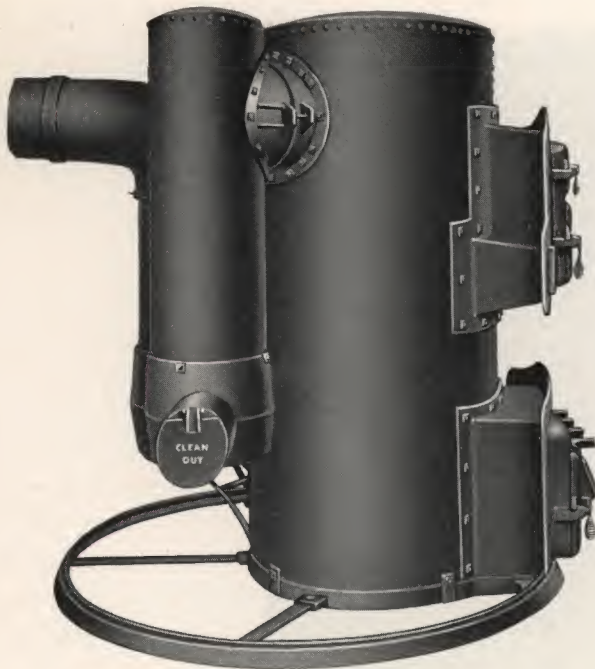
Notice riveted boiler construction of main drum and radiators. Also smooth rounded surfaces allowing free air passage through casing.



The Back of the **FRONT RANK** Steel Furnace

Fuel is saved by the indirect heating surface of the radiator. No furnace has more surface or longer fire travel than the "FRONT RANK." The three separate pipes, the dust box and the elbow not only provide an unusually long fire travel, but also give the greatest amount of radiating surface possible within the casing. By dividing the flame as it leaves the drum, they relieve the strain on the drum which occurs right at this point when the entire products of combustion are forced through one small opening. They also divide the heat equally on both sides

of the casing, making it impossible for one heat pipe to receive more than its share of heat at the expense of another. Being properly proportioned, they insure sufficient draft so that the furnace does not smoke even when the draft is poor or when the fire is being started. Therefore, no direct draft damper is necessary on the "FRONT RANK" Furnace. This arrangement also makes the "FRONT RANK" the easiest furnace to clean out of any design. The cleanout is placed, so that it almost tempts the user to use it.

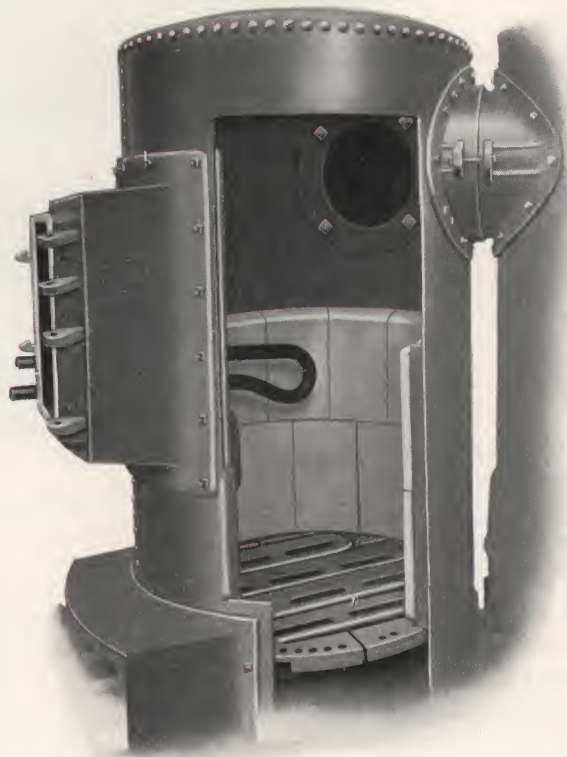


Side View of **FRONT RANK** Steel Furnace Less Casing

Notice tremendous heating surface on main drum, radiator pipes and dust box. Cleanout may be attached to either side of dust box, or two cleanouts may be used.

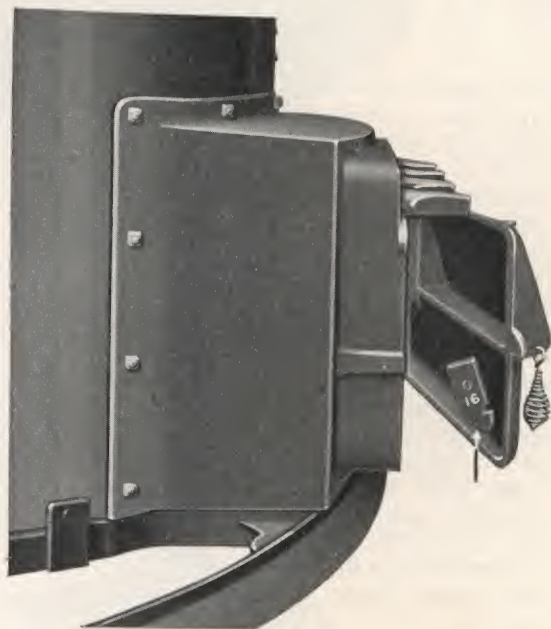
Cutaway Section of Main Drum of **FRONT RANK** Steel Furnace

Notice open area grate bars, size of fire brick lining, semi steel cast flanges on radiator openings and feed pouch, one piece feed pouch extending out through casing, water coil for heating water for household purposes.



Greater Advance in Dust Proof Construction

The 1926 model FRONT RANK Furnace is equipped with a one-piece ashpit pouch which extends beyond the casing line, and thus eliminates a trouble making joint.



The new Ash Pit Pouch showing detachable door catch (indicated by arrow)

The ashpit door is hung directly on this new pouch, instead of, as in the ordinary furnace, being mounted on a frame, which was in turn mounted on the pouch.

This feature strengthens and amplifies our claim that this good furnace is gas, smoke and DUST tight.

An expert workman grinds the doors specially to fit each ash pit and feed pouch, and when so fitted they remain in place and are shipped mounted, thus obviating the possibility of the installer switching doors from one furnace to another.

In shipping the furnaces, substantial wood frames are placed over the doors and pouches and

every effort is used to eliminate breakage in transit. However, due to rough handling on the part of the transportation companies breakage of the doors, hinges and lugs occasionally happens. For that reason the lugs and hinges are cast separately of *malleable iron* and bolted to the pouch. Should it become necessary, therefore, to replace the lug or hinge, all you need to do is order the small castings required and install them. You do *not* have to get a whole new pouch.

It will be noticed from the general construction of this furnace (see cuts on opposite page) that the entire heat radiating surface is within the casing—where it ought to be—no large heat losing surfaces outside the casing to result in waste. Every bit of the drum, pouches, collars, back-pipes, dust box, smoke pipe stub and elbow, etc. is constantly in contact with the air within the casing. The length of the fire and gas travel with the heater ranges from 9 feet to 37 feet depending on the size of the heater.

Primary heating surface may be defined as that in which one side is exposed to the fire and hot gases, the other being in direct contact with the air passing upward between the furnace and casing. The FRONT RANK has the largest amount of primary heating surface of any furnace on the market. The space between the ashpit pouch and the feed pouch is open within the casing, permitting the free circulation of air between them. The air heating space between the furnace and casing is so determined that just the right amount of air passes over each different size furnace. This volume of air is always sufficient to receive and carry away the heat generated so that no metal becomes overheated or burns out (See Illustration on page 13.)

FRONT RANK'S correct design and substantial construction assure the owner of many years of trouble-free service.

Always Gas Tight and Smoke Proof

The main drum or dome of the "FRONT RANK" furnace is built like a power boiler. Its riveted head and single seam are pressed together in the riveting process under such tremendous pressure as to make a seamless furnace. The body of this drum is made of No. 8 gauge and the head of No. 6 gauge Open Hearth Blue Annealed Cooper Bearing steel.

This seamless drum, surrounding the ashpit, the brick lined fire pot, and the combustion dome, eliminates three joints which are found at these points in the non-steel furnace. ***There is not a single joint in contact with the fire in the "FRONT RANK" furnace.***

The two rear radiator pipes and the center smoke pipe are made of the same riveted seamless construction and like the main drum are of Open Hearth Blue Annealed Copper Bearing steel.

Attached to the main drum is the ashpit pouch below the line of the fire, the feed pouch, and the radiator collars. These are made of semi-steel castings noted for their toughness and wearing qualities in resisting heat. All are securely bolted in place after first being mounted in Pecora asbestos cement.

The feed pouch and radiator collar openings, being in contact with the fire are protected by semi-steel cast flanges.

The feed pouch, the steel, and the flange after being mounted in Pecora asbestos cement are securely and permanently fastened together by heavy bolts, the heads of which are countersunk

to protect them from the fire. This pouch, as well as the ashpit pouch, extends outside the casing, eliminating another joint usually found in ordinary furnaces.

The radiator collar is first bolted to the drum, after being mounted in cement, then the flange is bolted over the steel, covering the heads of the collar bolts. The heads of the flange bolts, which are heavy machine bolts are protected by recesses cast into the flange. By an ingenious design the flange itself extends over the edge of the steel into the radiator opening, thus forming a smooth passageway for the products of combustion.

The central portion of this steel drum, which is the fire pot, is lined with two rows of fire clay tiles 21 inches high. This not only protects the steel at the hottest part, but prevents the air in the casing from being overheated at this point.

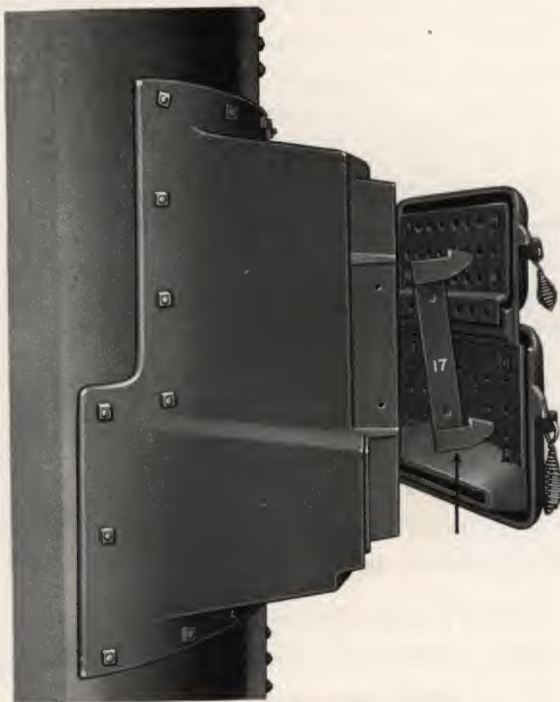
Two down draft pipes and one smoke pipe, are all of copper bearing steel, having the same riveted seamless construction as the main drum. These three pipes are connected by a one piece semi-steel casting—the dust box—which also contains the cleanout, and on top of the center smoke pipe is a one piece semi-steel cast elbow which extends outside the casing.

When the furnace is installed all of these parts are securely bolted together after first being mounted in Pecora asbestos cement, so that when the furnace is completely erected, it becomes permanently gas tight and smoke and dust proof.

Since the smoke, gas and dust cannot escape from the furnace itself into the surrounding air chamber, the warm air reaching the various rooms through the registers is always clean.



Showing exact size of head and body in Front-Rank Drums



One piece feed pouch extending beyond casing line.
(Showing detachable door catches indicated by arrow)

Very Easy on the Coal Pile

Combustion Engineers know that the economical burning of coal—especially soft coal—consists in burning the gas which forms from 30% to 40% of the heat value of the coal.

If this gas does not burn, it forms a heavy black smoke such as is commonly seen erupting from many chimneys. This smoke represents a tremendous waste of fuel.

The gas in the coal must be burned just as the gas in the kitchen range is burned. First, by mixing it with fresh oxygen—air; second, by providing space for it to burn in.

The air is supplied in the "FRONT RANK" furnace both through the grates and also by means of an ingenious hot blast device, which is a part of the feed door. This device draws air through the draft opening in the door, heats it, and then discharges it in a jet over the top of the bed of coals. This preheated air, mixing with the gas generated by the coal, causes the latter to ignite and burn, instead of being discharged up the chimney as smoke.



Showing Hot Blast attachment on feed door

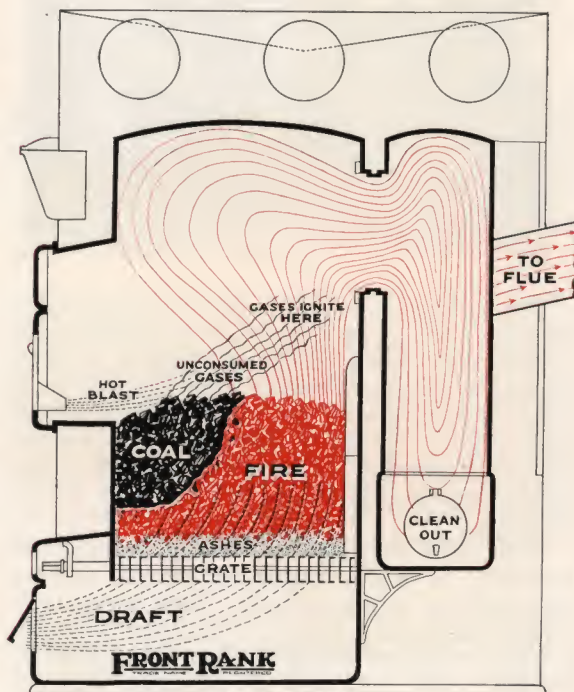
But this device would not be of any effect were it not for the large combustion space provided in the "FRONT RANK". The combustion chamber on the "FRONT RANK" is the same diameter at the top as at the fire, and the dome is of sufficient height from the fire to give ample room for proper combustion.

In this manner the "FRONT RANK" takes care of converting the heat latent in the fuel into usable form, but after the heat is extracted from the fuel it must be transferred into the air and this must be done while the heat is within the furnace casing.

The only way in which the air in the casing can be heated is by coming in actual contact with a heated surface. Therefore, the more heated surface there is in the casing the more air will be heated from a given amount of fuel.

Air as it is heated, has a tendency to move upward along the lines of least resistance. The "FRONT RANK" design takes advantage of this tendency by producing a series of smooth rounded heating surfaces which the air is constantly touching as it rises through the casing. The products of combustion on their way to the smoke pipe radiate heat first, in the large drum which itself has an area practically as great as the entire ordinary furnace, and then in the three back pipes, the dust box and elbow, giving nearly double the radiation produced by the poorly designed furnace. All of this radiation is useful because, as we have just seen, the air is in constant contact with all of the heated metal.

Another fuel economy feature is the method of keeping the surfaces clean. Soot keeps the heat from radiating into the casing. The average furnace being difficult to clean because of its construction is usually covered with soot after being in use a few months. Thus a great deal of the heat is wasted. The "FRONT RANK" design is all vertical and smooth, so that the soot cannot cling to its surfaces. The only part requiring cleaning is the dust box at the foot of the radiator, which can easily be cleaned with the scraper that accompanies the furnace.



A Child Can Operate the **FRONT RANK**

As you will notice from the pictures, the "FRONT RANK" furnace is of a very simple, though efficient design.

Its operation is equally easy. All you have to do is to put fuel on the bed of coals at regular intervals, shake down the grates and remove the ashes once a day, and keep the water pan filled. If you don't have an automatic draft control, you will also regulate the draft when necessary by means of the handy regulator in one of the upstairs rooms, but beyond that, the operation of the "FRONT RANK" Warm air heating system is automatic.

When it isn't needed it remains in the basement without causing any trouble or worry. Yet, when it is needed it is instantly ready as soon as the fire is started. There are no water pipes to freeze, no valves to leak, no gauges to read. You can leave it in the dead of winter and return, light the fire, and it goes on delivering heat just the same as ever.



Convenient regulator operates drafts from first floor room.

Built to Last as Long as the House

Because of the simple construction of this powerful heater repairs are practically unknown. There is nothing to get out of order and once it is installed it becomes a permanent part of the building, having no actual depreciation and retaining the same relative value through the years as the walls themselves.



This permanence is due not only to the design, but also to the materials used in manufacture.

The steel parts of the "FRONT RANK" furnace are made of copper bearing steel, which is an alloy made by the addition of a certain percentage of copper to well made steel, thereby greatly increasing its wearing qualities under actual service conditions. This steel is rust resisting.

Plate steel as a substance has great tensile strength. It is also pliable and can be rolled or bent without injury to itself. That accounts for its great wearing qualities when used in furnaces.

The fire brick tiles used in lining the "FRONT RANK" fire pots are of Missouri Fireclay,

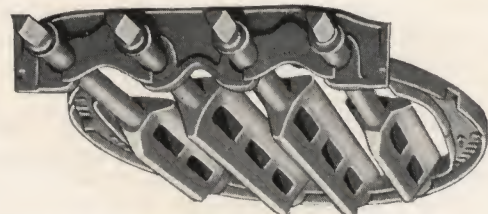
famous the country over as the best for that purpose. They add to the lasting qualities of the furnace, both by protecting the steel and by themselves not requiring to be renewed.

The semi-steel castings used in the "FRONT RANK" are much stronger than ordinary gray iron castings and will last as long as the steel parts.

The "FRONT RANK" radiator, instead of adding its weight to the top of the furnace, is attached to the back of the main drum, supported by means of brackets bolted in place. Thus the weight is properly distributed and no part is subjected to unusual strain.

The grate bars, of triangular design, have three burning surfaces, and are ventilated so that it is almost impossible to clog them up with clinkers. This adds to their lasting quality. There are no "fingers" to burn off or to be broken in an attempt to dislodge clinkers. As each bar is shaken separately absolute control of the fire can be assured and the grate bars are also much easier to turn.

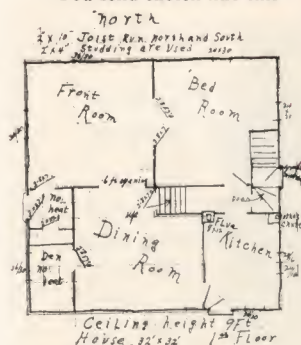
The "FRONT RANK" furnace not only requires very few repairs, but also is noted for its long life. Twenty-six years ago we made a change in the grate bars and because of the large number of these old style furnaces—26 years old or more—still in service, it is necessary for us to carry a complete stock of the old style grate bars at all times.



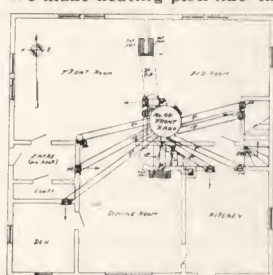
Separate Shaking Grates, each having three surfaces with ventilating openings.

Proper Engineering of Vast Importance

You send sketch like this



We make heating plan like this



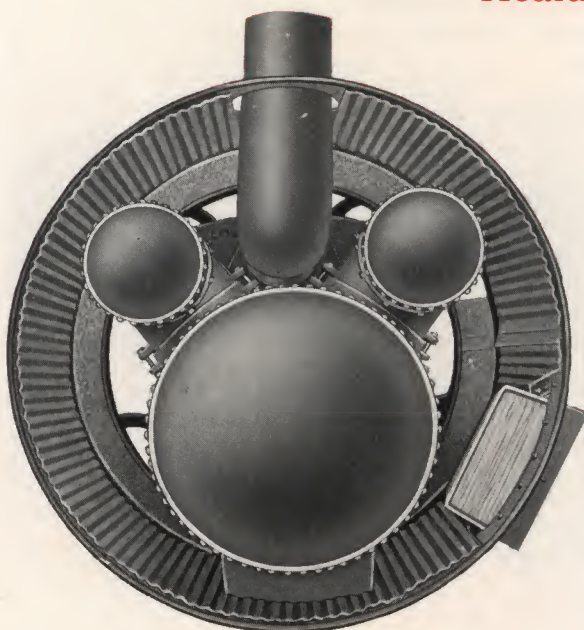
The "FRONT RANK" furnace is very conservatively rated. In fact, the usual rule for rating furnaces—1.8 times the area of the grate equals the area in sq. inches of the warm air pipes to be supplied—would raise our ratings fully 25% or, in other words, recommend a furnace one size smaller than is usually used.

We do this purposely because of the tendency to install a furnace which will just barely suffice in ordinary Winter weather. The "FRONT RANK" furnaces installed according to our ratings, therefore, are oversized furnaces which will deliver their fullest capacity without forcing in that below zero weather, which is the real test of any heating plant.

"FRONT RANK" dealers know that they can safely guarantee the "FRONT RANK" furnace to heat in the coldest weather. They know, too, that the Engineering Department of the "FRONT RANK" folks are competent from their 38 years experience to advise and plan the details of any particular installation, and the growth of our Engineering Department from a single man to a complete corps of heating engineers, draftsmen, etc. indicates the value to our dealers of this service. A plan thus engineered by the LANGENBERG MANUFACTURING CO. is fully guaranteed by the Company, as well as by the local dealer.

The engineering principles on which warm air heating is based, have been reduced to a science and embodied in a Standard Code, which has the endorsement of The American Society of Heating & Ventilating Engineers, The National Warm Air Heating & Ventilating Ass'n., the National Association of Sheet Metal Contractors and other organizations interested in heating. We recommend that any person, before having a furnace installed, or indeed before having his house built, secure a copy of this Code and have it carried out in the building of the house, of the chimney, and of the heating system. Copies of the Code can be secured from any "FRONT RANK" dealer or direct from the LANGENBERG MANUFACTURING CO.

Every Room Made Comfortable With Abundant Healthful Heat



Looking into the "FRONT RANK"

The proper method of warming any home is by gently pouring an abundant stream of moist warm air out of the registers where it displaces cooler air which is returned to the furnace through the cold air registers and pipes. Thus the air is constantly in motion and is never stagnant.

A cut on this page shows the large space within the "FRONT RANK" casing. This insures an ample quantity of air to supply the various pipes. It also shows the substantial character of the casing with its inner lining of corrugated galvanized iron. It also shows the location and size of the vapor pan, which, placed near the hottest part of the furnace, vaporizes the water and mixes the vapor with the air, so that it reaches the home in a properly humidified condition.

A proper amount of humidity is necessary to health and this can only be secured during the Winter by the "FRONT RANK" type of heating system.

A Strong Company Making A Worthy Product



What The Leading Dealers In Four States Think of the "FRONT RANK" and The Langenberg Manufacturing Co.

"We like to do business with Langenberg Manufacturing Co. because it gives the dealer a square deal. We like the "FRONT RANK" furnaces because we have an absolute faith in them and this faith is justified by what we have learned from the years of experience in handling them.

We keep a record of every furnace we install, giving the owner's name and address, number and make of furnace, dates sold and installed and if a replaced job, the name of the furnace taken out. We also keep a record of every furnace repaired, giving the owner's name, kind of furnace, and what repairs they use. These two records will show that the "FRONT RANK" is the cheapest in the end.

The best boosters we have are those who have had another furnace and had it replaced with a "FRONT RANK." They know there is a difference, especially when it comes to operating the grates or cleaning it out, also to the saving of fuel."

THE ROLAND BEACH COMPANY
Richmond, Indiana

"After a few years of effort on my part in explaining the construction and demonstrating the efficiency of the "FRONT RANK" furnace, it practically sells itself. "FRONT RANKS" are now being specified quite freely in the construction of new homes in Canton.

My enthusiasm for the "FRONT RANK" furnace was not caused by the furnace alone but is aided greatly by the splendid organization that is manufacturing this product. It is absolutely the finest concern it has ever been my pleasure to transact business with."

(Signed) W. S. GROSJEAN
Canton, Ohio.

"We attribute our success in selling "FRONT RANK" furnaces to the fact that we have all faith in the furnace. We believe it is as good or a little better than any of its type. When installing the furnace, we feel we know what it will do and we never overstep the mark, and so the users become "boosters" and help to sell more "FRONT RANKS".

(Signed) J. W. SHOENFELT,
Altoona, Pa.

"If a prospective dealer would come to me today and want to know why I like the "FRONT RANK" better, I would tell him this—There is not an inch of waste radiating surface on the whole furnace and it has the best and heaviest grates of any furnace, and it will heat more space with the same size fire pot with the large casing than any furnace known to me today, and if properly installed (not over-piped) there is not an equal on the market. I have had personal friends go somewhere else and buy—get stung and come back and stay back.

(Signed) F. H. DUDLEY,
Lincoln, Neb.



The Langenberg Manufacturing Company, makers of the "FRONT RANK" Steel furnaces, have been established in St. Louis since 1888.

Since the first day of business we have devoted our entire time and efforts towards making the finest type of home heating devices. During those years we have acquired experience which could not have been gotten otherwise, and which enables us to foresee the trends of the times, and make provision for them.

That accounts for our having been in operation for a generation and a half continuously without a break. It accounts for our having at present assets of over half a million dollars, with a capital practically all gradually built up by putting back into the business a part of the earnings, and thus being independent of the money market. It accounts for our having the highest credit rating given by Dun or Bradstreet for the amount of capital invested.

We have the ability, therefore, to make good on any contract.

The name "FRONT RANK" is in itself an inspiration. Nothing could be more ironical than to give our product the name "FRONT RANK" and let it occupy any other place.

We are prouder of our good name than we are even of our fine factory or our strong organization, and our entire resources are ready to maintain that good name.

The "FRONT RANK" furnace was first installed in St. Louis. It was then a new type of heating system—a discovery in the science of heating homes. Its advantages were instantly recognized, and it was not long before its fame began to spread in all directions from its home town.

While building up a satisfied custom in St. Louis which now numbers more than FORTY THOUSAND USERS in its home city alone, it also spread its fame and its good work to all parts of the country and even to foreign countries. There are at this time not less than one hundred thousand "FRONT RANK" heating systems giving satisfying service, many of which have been on the firing line for twenty five years or more.

The **FRONT RANK** Battery



Specially adaptable for the heating of large spaces, such as, churches, schools, theatres, etc., which would require more than a single unit. Also in large residences, where one large furnace will ordinarily supply enough heat, it is not only more economical to use a "FRONT RANK" Battery, but more satisfactory from the fact that in fall and spring, or in mild weather, when but little heat is needed, one of the furnaces will supply sufficient heat for the whole house.



*Fred Sharon Estate, Menlo Park, Calif.
40 rooms.*

*1 #160 and 1 #421 Front Rank
Installed by Montague Range & Furnace Co., San Francisco*

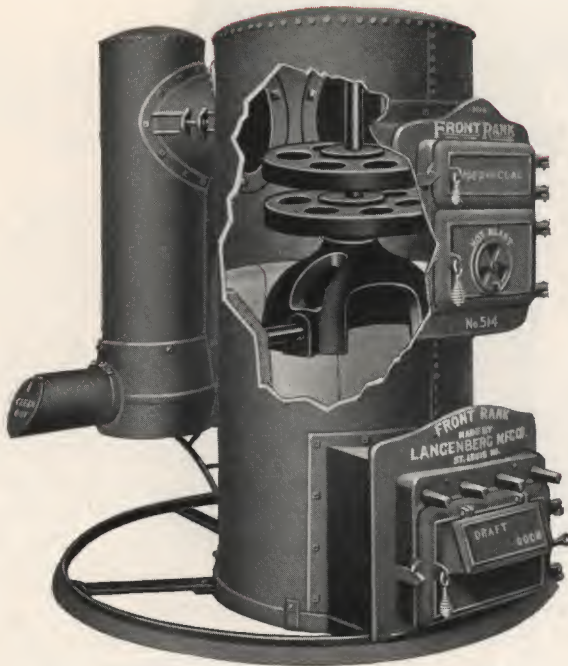


*Home of Edwin F. Guth on Berry Road,
St. Louis County*

2 #541 Front Rank Furnaces



Combination Hot Water and Warm Air



Compact and Simple When Installed

The success of the "FRONT RANK" combination system of Hot Air and Hot Water has been proven scores of times.

Structural difficulties which prevent the use of air pipes are overcome. Outlying rooms, conservatories, garages, can be very effectively heated with this auxiliary. A plumber can connect this system.

This combination can be used in any dome type furnace.

The boiler and rings should be about eight inches (8") less in diameter than the combustion chamber of furnace.

One or more rings can be used, depending on the amount of radiation used. All mains and risers not covered are counted as radiation.

Special care must be used in balancing the system. We furnish plans free for this class of work.

All glass surfaces, exposed walls, cubical contents and points of compass must be given in submitting sketches. Blue prints would be preferable.



Ring



Dome or Bell

No.	Size	Size of Connection	Weight	Capacity of Boiler in sq. ft. Radiation
120	12-in. Base only.....	2 in.	37 lbs.	50
121	12-in. Base and one ring..	2 "	67 "	80
122	12-in. Base and two rings	2 "	97 "	120
140	14-in. Base only.....	2 1/2 "	53 "	125
141	14-in. Base with one ring.	2 1/2 "	91 "	200
142	14-in. Base with two rings	2 1/2 "	129 "	275
180	18-in. Base only.....	3 "	90 "	225
181	18-in. Base with one ring.	3 "	154 "	335
182	18-in. Base with two rings	3 "	218 "	445
220	22-in. Base only.....	3 "	118 "	335
221	22-in. Base with one ring.	3 "	198 "	480
222	22-in. Base with two rings	3 "	278 "	625

Front Rank Ideal for Oil and Gas Burners



*Residence of G. F. Langenberg, 7017 Kingsbury Pl.
University City, Mo.*

The use of oil burners for residence heating is becoming a favorite with a great many home owners. The following facts compiled from information received from oil burner manufacturers will, therefore, be of use to both furnace installers and furnace owners.

1st. It is essential that the furnace be leak-proof when using oil as a fuel. Most oil burners are automatically controlled so that when the temperature in the room has reached a specified degree the burner is shut off until the temperature falls and then started again. This "on-and-off" method of control produces two strains upon the furnace. The first is due to the rapid expansion and contraction caused by excessive temperature changes; and the second due to the partial pressure produced in the furnace as the burner comes on.



*Residence of E. E. McMullen, 7323 Richmond Pl.
Maplewood, Mo.*

The Front Rank steel furnace being of riveted boiler plate construction does not leak. Plate steel being flexible, absorbs the rapid expansion and contraction, and the different degrees of pressure, very much as the automobile spring absorbs the shocks of the road. As there is no cemented joint in contact with the fire in the Front Rank furnace the oil burner has no bad effect on it.

2nd. The flames must not touch the metal. The flame from oil burners being near perfect combustion produces a very intense heat which no metal, either cast iron or steel, is able to withstand. Front Rank furnaces have their fire pots lined with refractory materials which are not destroyed by high temperatures.

The illustrations herewith show typical homes heated by Front Rank oil burner installations. Practically all of the well-known oil burners, such as Hardinge, No-Kol, Oil-O-Matic, Ray, Scott-Newcomb, Hart, Kleen-Heet, Oliver, Rotary, etc., are being used in connection with Front Rank brick lined steel furnaces with excellent results.

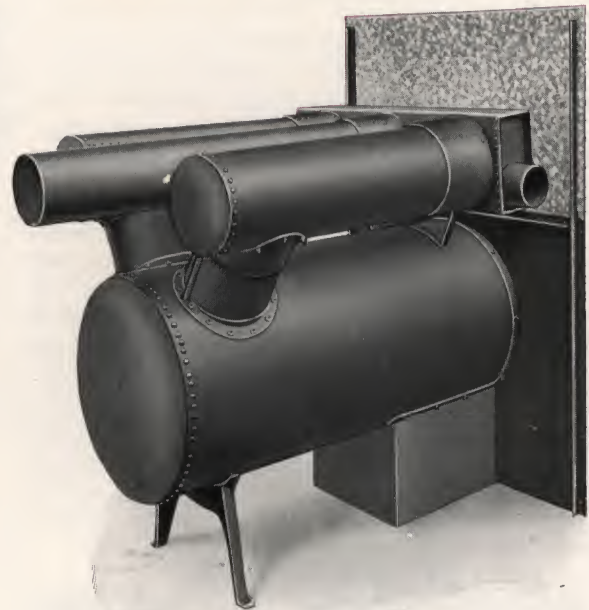
What has been said about oil burners applies equally in the case of gas burners. We manufacture gas burners for use in Front Rank furnaces, and our furnaces may also be successfully used with any type of furnace gas burner.

The Front Rank gas burner may be used either with natural or artificial gas and may be regulated by hand or automatically. When manual regulation is used two intakes are provided each controlling four of the eight arms. This allows great flexibility of regulation so that the amount of heat required by the outside temperature will always be available without wasting gas.

The complete Front Rank Heating and Ventilating System includes automatic humidifier, automatic temperature regulation, fan, air washer or screen, and ozone machine. This is the ideal system for residence, church, school, store or small factory, because it supplies heat, ventilation, air conditioning, air cleaning and humidity, and may even be used in the summer months to help reduce the temperature indoors. Separate illustrated booklets treating of these accessories will be gladly furnished on request.

Improved Wood Burning Furnace

In sections of the country where wood is a less expensive fuel than coal, there is a demand for a first-class wood-burning furnace. The "FRONT RANK" Wood Burning Furnace is made expressly to fill this want. It is constructed on similar lines to the "FRONT RANK" coal or wood burning furnace and has in common with it the two large radiators, dust box and smoke flue. This furnace is built on horizontal lines. The cold air inlet may enter on either side of casing or through the rear. Particular attention is called to the size of the feed door for the admission of very large fuel. The fire chamber is of a depth to accommodate four-foot cordwood.



FRONT RANK IMPROVED WOOD-BURNING FURNACES
Made in Following Sizes

Number of Furnace.....	66	88
Diameter of Drum..... inches	26	32
Diameter of Radiators..... inches	11	15
Diameter of Smoke Pipe..... inches	8	9
Length of Drum..... inches	54	54
Size of Feed Doors..... inches	16"x 19"	16"x 19"
Inside Dimensions of Casing.....	3'10" x 5'4"	4'6" x 5'6"
Minimum Height of Casing.....	5'9"	6'2"
Heating Capacity..... sq. inches	600	800
Shipping Weight, complete, about.....	750	850

HOW TO CONSTRUCT BRICK WORK IN INSTALLING FRONT RANK WOOD FURNACES

Casing walls are built to a point about parallel with top of Furnace, after which the collars for the warm-air pipes are placed and the wall continued to a point flush with the top of the pipes. Iron bars are then placed across the casing, and on these a sheet-iron covering is laid. The wall is continued above the sheet-iron covering two tiers, then sand is filled in to the top of the bricks. Cold-air duct may enter casing at either side or rear end.

Brick required for 66 Casing—2,000. Brick required for 88 Casing—2,400.

Warm Air Heating and the Standard Code

One of the first things to be considered in home heating is the maintenance of correct air conditions in the home.

We think of food, water and air as three vitally essential things of life—but science has demonstrated that a man can live forty days without food—four days without water—but only three minutes without air.

And yet—AIR—the most important of these three necessities—usually receives our least consideration. It is everywhere about us—it is so common, so invisible, that it is either not thought of at all or taken as a matter of course.

But night and day the health and comfort of the entire family depends upon the condition of the air in the home. In the Summer proper air conditions can be maintained simply by opening the windows. In cold weather we have another set of problems to face.

The air must be warmed—it must be kept in circulation—it must carry the right amount of



*A Typical Home
Built by the City and Suburban Building Co., Ft. Wayne,
Ind. This and most other homes built by that company
are heated by Front Rank Furnaces.*

It is quick in operation. The warm air is pouring out of the registers a few minutes after the fire is started.

Its cost of installation is less than any other system, and maintenance costs are practically negligible.

It utilizes no furniture space in the house and adds practically no weight to the building.

It is the only system which can be used in connection with fans, air washers, ozonators and other air conditioning apparatus.

Other heating systems may offer some of these advantages, but no other heating system ever devised offers all of them in the same degree of efficiency as a system of warm air heating that

Messrs. Snyder & Lehnen
Agents for Front Rank Furnace
Lafayette, Indiana
Gentlemen:

The house which the family of Owen Ball has occupied since May 1st, 1846, now seventy-nine years, was never satisfactorily heated until you installed a large "FRONT RANK" furnace two years ago. The house contains fifteen rooms and the furnace has heated them to our entire satisfaction in all respects, including economy.

Very truly yours,
Walter J. Ball

moisture—and it should be clean and free from gas, smoke, soot and dust.

A warm air heating system properly installed and properly operated will maintain these ideal air conditions better than any other heating system in existence.

It is the only system by means of which the air conditions can be easily regulated and are under prompt control.

It creates and maintains a constant movement of air throughout the entire house.

It automatically supplies the percentage of moisture in the air necessary to good health.

It may be provided with air screening devices for the removal of dust and dirt prevalent in larger cities.

It can be automatically regulated so as to require the minimum of attention.



Ball Residence, Lafayette, Ind.



Home of M. Koshland
3800 Washington St., San Francisco
1-601 Front Rank installed by Montague Range & Furnace Company

has been properly planned and correctly installed.

That all warm air heating systems have not given this service in the fullest measure has been due, not to the system itself, but to other causes. Often, the builder instead of planning his heating system when he plans his home leaves this important subject until the house is almost completed, and then the heating contractor has to do the best he can. Secondly, the fault is due to improper installation and the faulty and careless work on the part of certain installers who have endeavored to meet competition with unskilled labor and necessarily inferior workmanship.

What constitutes proper installation? To answer this question on an exact and scientific basis the manufacturers of warm air heating systems through their national organization have devoted years of time and many thousands of dollars to laboratory research work and have conducted an elaborate investigation in a typical American house, especially erected for this purpose at Urbana, Illinois.



The Warm Air Heating Research Residence
Equipped with most complete set of temperature, humidity, and draft recording and controlling instruments in existence. Located at Urbana, Ill., it is used by the Mechanical Engineering Department of Illinois University for making their tests on warm air heating.

This research and investigation at Urbana was conducted under the direction of Prof. A. C. Willard, head of the Department of Mechanical Engineering in the experiment station of the University of Illinois. In this building the exact conditions which are to be found in your home were duplicated. Every detail regarding furnace installation was carefully checked and re-checked. The proper size of the flue was computed together with the height of the chimney. The proper location of the furnace, the diameter and slope of the pipes, the provisions for regulating the air conditions of the home, heating the air, circulating the air, cleaning the air and humidifying the air. All of these and scores of other important items were determined on an exact basis. The findings of Prof. Willard have been accepted as the highest authority by the Manufacturers of warm air heating systems and have been adopted as the Standard Code, regulating the installation of warm air heating systems.

This Standard Code is now in successful operation. It is the rule and guide of all conscientious furnace installers and furnace dealers.



Gentlemen:-

Referring to the furnace which you installed in my home over 15 years ago wish to say that this furnace has given entire satisfaction the entire time and is at present practically as good as new.

If you wish to have anybody look at this furnace, do not hesitate to do so.

Yours very truly,
L. C. Frohrieb
Secretary, Federal Engineering Co.
Pittsburgh, Pa.



It has been put into pamphlet form and is now available to the public, architects and builders, and all others.

The National Association is rendering every cooperation to the dealers and installers to assist them in carrying out the provisions of the Standard Code. At the same time the National Association is placing in the hands of the public the means by which they can protect themselves against all violations of this Code. All that is necessary is for builders to incorporate this clause in their contracts: "A warm air heating system is to be installed in accordance with the Standard Code regulating the installation of warm air furnaces in residences." All plans designed by our Engineering Department are in accordance with this Standard Code. A copy of the Code can be obtained from "FRONT RANK" dealers or from this company.

Build the Home Around the Heating System.

Since the heating system is the most important single item in the building, so far as your comfort is concerned, it ought to have the 'right of way,' even when it comes to planning the building itself; that is, if a particular type of construction or a certain detail in the plan materially interferes with the effective working of the heating system, that type or that detail should be sacrificed rather than to run the risk of having winter discomfort.

Fortunately the requirements of the heating system are few, do not run counter to the usual methods of construction and cost no more than any other method. The principal ones are given below, but before outlining them it is well to call attention to the fact that the very best method of assuring that your home will be properly built and properly heated is to put the entire project in the hands of a competent architect.

The architect is more than a designer of buildings. His is the vision that conceives the



*Home of Ralph Staley
119 University Circle, Canton, Ohio.
Heated by Front Rank furnace, installed by W. S. Grosjean.
There are so many Front Ranks in Canton that Real Estate
Dealers advertise the furnace as one of the selling points of
their homes.*

competent and then leave all these details in his hands, you will get much more satisfaction and have much less to worry about.

One of the details of the architect's work is to let the various contracts covering the different phases of the building and one of the most constructive ways in which he serves you, the home owner, is to see that the contracts are let only to those contractors who are responsible financially, as well as competent. He also, of course, closely supervises the carrying out of all contracts and holds the contractors responsible for any failure to live up to the specifications.

When the average home owner attempts to let all the contracts for his new home, he is likely to be imposed on by contractors who could not properly carry out the work they attempt. Such contractors would of course have no standing before an architect.

Myself and family have had the comfort of a "FRONT RANK" Furnace for the past 12 years and the grate and the furnace itself are as good as new. If at any time we should be in need of a new furnace, the "FRONT RANK" would be the one considered by us as it has always been satisfactory and especially economical both in fuel and repairs.

We have recommended it to many of our friends and they express the same feeling as I do when questioned about it. If you want comfort, economical comfort, install a "FRONT RANK" Furnace in your home and then you will have a "FRONT RANK Home."

Respectfully yours,
Jacob J. Blumer.
Pittsburgh, Pa.

finished home before it is ever started—before even the first drawings are made. After fathering this creation, for it is nothing less, he is naturally interested in the proper development of his brain child. It is not only his duty but his pleasure to see to it that the multitude of details making up the home which you will live in are carried out in their proper sequence and in their proper relation to each other. He will see that the necessary provisions are made, for instance, for the proper reception of the heating plant, the plumbing fixtures, the electric lighting system, etc. He is abundantly more competent to do this than is the average home owner, who probably builds only one home in a lifetime. If you will first see that your choice of architect is



*Home of Frank Geers
200 S. 18th St., Richmond, Ind.
One of the many fine homes in that city heated by Front
Rank Furnace installed by The Roland-Beach Co.*



*Home of Mrs. Mary Marquis
Pacific, Mo.*

It seems desirable to say a word here about the practice of some home owners of letting contracts to the lowest bidder without regard to his competency or responsibility. If he is bonded and you have definite written specifications to hold him to, this may not result in a serious disaster, though it is never so satisfactory as confining the bids to those who can furnish acceptable evidence of their responsibility and success in carrying out other contracts.

But if this is true, what must be said of those, who without any specifications whatever, without any technical knowledge of the subject, sometimes without even a clear idea of what they want or need, ask for bids on-say, a heating system to heat the home in which they and their families expect to spend their lives, and then accept the lowest bid without even getting a written agreement as to what the heating con-

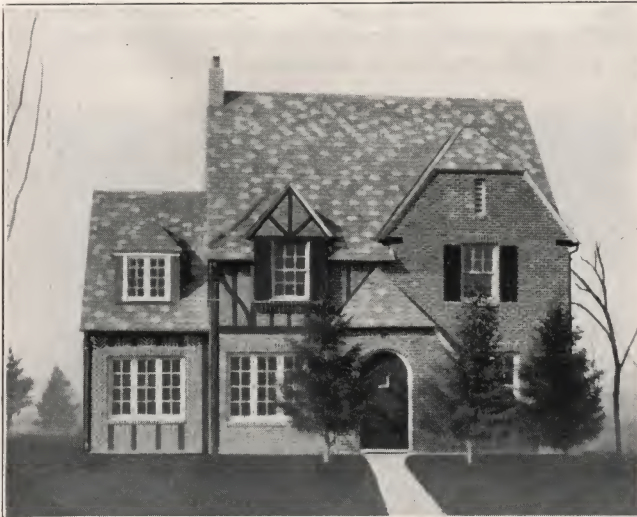
tractor proposes to do or to furnish. Is it any wonder that many homes are improperly heated?

It is natural for everyone to endeavor to save money where they can, but too many of us confuse economy with cheapness. Because a thing is cheap, it does not necessarily mean that it is economical. The reverse, indeed, is usually true. It is reasonable to suppose that in this day of keen competition no manufacturer could remain in business, who persistently overcharged the public—who failed to give a dollar's worth of merchandise or service for every dollar he asked. Therefore, when the price of two heating installations vary materially, common sense would dictate an investigation as to just what each contractor proposes to do or to furnish before deciding.

When you purchase a heating system for your new or old home you make an investment which will affect your future for twenty-five or thirty years. Our homes are the centers of all social activities, our families grow up in them, our most congenial hours are spent in them. It is necessary for our health's sake that they be made as livable as possible.

In our climate during nearly half of the year the home cannot be occupied without artificial heat. You are not buying merely a furnace, therefore, but securing your future health and comfort during the winter time. If you install a furnace which is not of the proper size it will not only mean the use of more fuel than should be necessary, but may also mean sickness to your family because of improperly heated rooms. The average man when once his furnace is installed, usually puts up with it even though he finds it a disappointment. If it is not big enough to heat his whole house he gets along with it by shutting off certain rooms and when he or his family enter those rooms, there is great danger of catching cold.

Fortunately, the adoption of the Standard Code regulating the installation of warm air furnaces in residences now makes it possible for the home owner himself, as well as the architect, to know what he needs in the way of a heating system and furnishes him with a definite standard to check the work by. This Code has been compiled, approved and adopted by the American Society of Heating & Ventilating Engineers, the National Warm Air Heating & Ventilating Assn., (the furnace manufacturers), the National Association of Sheet Metal Contractors (the furnace installers) and other associations interested in heating. It is based on tests carried out and being continuously run in a special testing plant at the University of Illinois. This plant is under the supervision of the Mechanical Engineering Department of the University and as such it furnishes none but strictly unbiased information based on proven facts.



*Stratford Manor—Lincoln's Home Beautiful
Built as a model home thru the cooperation of the Lincoln
Star by Harvey Rathbone Co. Heated by Front Rank
Furnace installed by F. H. Dudley, as are most of the fine
homes built by that firm.*

Therefore, in asking for bids on a heating system, it is vital to specify that this heating system is to be installed in accordance with the Standard Code and to require each contractor to furnish either a plan showing the size and location of each pipe and register, or a data sheet, showing that he has figured the heat losses in accordance with the rules given in the Code.

Most of the construction features, to which we will now call attention, are covered in the Code, so that if you will incorporate this Code into your building specifications you will be assured of a properly heated home.



Dear Sirs:

I am in receipt of your letter of May 13th, and am very pleased to state that we have nothing but praise for the "FRONT RANK" System of home heating, that we now have in our residence at 464 West Lockwood Avenue, Webster Groves, Missouri.

I feel that I am in a position to give my opinion on this because we have used other types of heating, including both steam and hot water, and we prefer the "FRONT RANK" System.

There are a number of claims made in favor of all classes of heating, and the point that the other systems bring out is that hot air heating is much dirtier. The results obtained by ourselves have been directly opposite.

The interior of our residence embodies by far the most expensive type of finishing, and there is practically no dirt above the register. In our particular case we use casement cloth in the register so as to prevent the dirt from coming into the rooms.

One point that is of particular interest to me is that with the "FRONT RANK" System of heating the registers lend themselves admirably to the decorating scheme, not taking up any room, or spoiling any effects you might want to obtain.

I intend to use your system of heating in a new residence that I am contemplating erecting on Warson Road just west of the St. Louis Country Club, and as soon as I am ready to go into this matter, I will refer to you.

I trust this is the information you desire, and hope we may be of mutual benefit to each other, I remain

Yours very truly,
William T. Deacon.



The provisions to be made for the heating system fall into three natural divisions, those in the basement, those in the house itself, and those in the chimney.

The furnace itself, in order to give best results, should be placed as close to the center of the building as possible. Where this is not practical, the North, the West, or the Northwest should be favored. The furnace should never be placed in the South, the East, or the Southeast portions of the basement.

Basement Requirements

The best results are obtained with a warm air heating system where all of the warm air pipes are short and direct. Long pipes or abrupt turns create friction, causing heat losses which must be made up by larger pipes and a larger furnace. The pipes should also have a continuous upward pitch from the furnace to the register of not less than one inch to each running foot, and the more pitch the faster the air will flow. Since the average furnace stands between 5'-6" and 6 ft. when fully cased, the minimum basement depth should be 7 ft. and an even deeper basement will prove a good investment. Where it is not practical to excavate the entire basement to the required depth, a pit may be made which is large enough for the furnace and cold air connections with space in front to swing the ashpit door open.

One difficulty often encountered in basements is the location of supporting girders in such a way that the correct placing of the basement pipes is interfered with. Another is the location of the basement stairway in such a way that one either has to stoop in descending the stairs to avoid the heating pipes, or the heating pipes must be detoured around the stairway causing additional friction producing turns and twists. By referring your house plans to your heating contractor, both of these difficulties can be overcome ahead of time by slight changes in the plan without altering the cost of the building. It is pertinent to say here that under no circumstances should there be any downward pitch in any heat pipe, as this creates a cold air pocket in the pipe itself retarding the flow of warm air.

Should your basement be divided into several rooms, care must be taken that the heat pipes do not touch any of the partition walls. If they are made of wood this is necessary from a fire prevention standpoint. If they are made of concrete, brick, masonry, etc. it is necessary from a heating standpoint because these substances absorb the heat from the pipes they touch taking that much away from the rooms above and often entirely stopping the flow of heat in the pipes. A ventilated safety thimble should be placed between the pipe and the partition.

If the specifications call for the use of outside or fresh air, consult your heating contractor ahead of time as to the proper size of the cold air intake opening to leave in the outer wall; otherwise, if it proves to be too small your heating system will suffer or you will have to use one of the basement windows for the air intake. A proper and adequate supply of cold air, whether from inside or outside, is the most important single provision in the installation.

For the average residence having six or less regular occupants, outside air supply to the

furnace is unnecessary. Sufficient leakage around the doors and windows provide ventilation, and the warm air heating system, itself, which provides continual circulation and moistening of the air in each room reconditions the air to a large extent. Outside air entering the furnace at or near zero requires considerably more fuel to heat than inside or re-circulated air which enters the furnace at about 60 to 65 degrees. Where however weather strips are used to seal up all openings a small outside air supply pipe can be added to the re-circulation system.

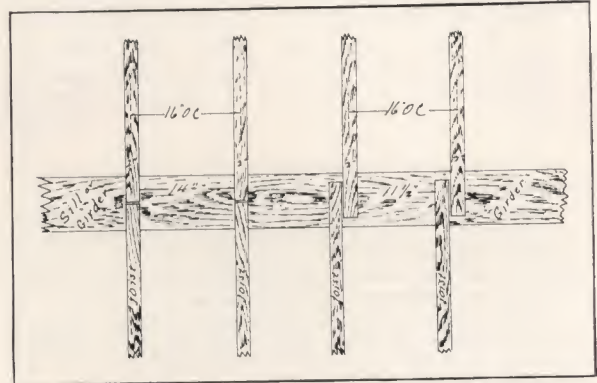
When outside air is not used, the approved practice is to re-circulate the air from the house by means of metal ducts leading from one or more rooms on the first floor. In order to get the greatest efficiency, these return air ducts must be large enough so that their combined area will equal or exceed the combined area of all of the warm air pipes. They should, if possible, run on a gradual downward slope from the cold air register to the bottom of the furnace casing. Sometimes this is not practical, as it would interfere with the use of the basement for anything but the heating plant, but whenever it is possible better results are obtained. In planning the basement, therefore, have your heating contractor indicate the proper location of the cold air ducts and give these preference, then you can use the remainder of the basement for the fuel bin, laundry, fruit cellar, or what not.

Where it is not possible to run the cold air duct directly from the register to the furnace, it is the practice to fasten a square galvanized iron duct to the basement ceiling or joist and run this on a straight line from the register to a point near the furnace and from there connect this square pipe with a round pipe leading directly to the bottom of the furnace casing. It is especially necessary to see that this square pipe is at least equal in area to the round pipe to which it is connected, that it is not obstructed at any part of its length, and that it is made as short and direct as possible. The practice prevalent in some places of nailing a sheet of iron to the bottom of the joists and attempting to convey the air through the space thus created between the joists and the floor above cannot be too strongly condemned. In the first place, the space provided is too often insufficient, in the second place, the rough unfinished boards of which the average basement joists are constructed offer too much obstruction to the free flow of the air, and finally it is almost impossible to make such a job dust proof.

Requirements in House Proper

So much for the basement. The warm air heating system occupies less valuable space in the home than any other. All that you can see is a register, either in the floor or in the baseboard. This register can only serve you adequately if the space within the inside partitions of the house is proper utilized. A certain mini-

mum space is required which can be detailed to you by your heating contractor and which must be provided to insure the proper working of the heating system. A few general rules will be of benefit here. First, the first floor joists should be placed on top of the basement girders or "I" beams, so that the space formed by these joists—usually ten inches can be utilized for the heating pipes. These joists should also butt and not lap. A graphic idea of how the space is reduced by joists that are lapped is shown in the accompanying drawing.



Effect of lapping joists on space available for stacks.

The studs, or uprights, forming the inner partitions and supporting the second floor or roof should be set immediately above the corresponding joists preferably on 16 inch centers, so as to provide a continuous space 14 inches in the clear.

For the same reason the second floor partitions should, where possible, coincide with those on the first floor so that registers may be run to second story rooms without the necessity of running the pipe under the floor.

We are going to make a rather radical suggestion here, which indeed is provided for in the Standard Code mentioned before. It is that those partition walls, in which the second or third floor stacks are to be set, be made of 2 x 6 studs instead of the usual 2 x 4's. The reason for this is evident. The clear space in a partition made by 2 x 4 studs set on 16 inch centers is about 3½ x 14 inches or 49 sq. inches. If the studs are set on 14 inch centers the space is only 3½ x 12 inches or 42 sq. inches. A stack of this size is sufficient to heat only comparatively small rooms to 70 degrees in zero weather. Therefore, large upstairs rooms are commonly heated by two registers or not properly heated at all. Furthermore a square stack is more efficient than an oblong one.

In the average home it will be found practical to place all of the second floor stacks in two or three inner partitions. The extra cost of using 2 x 6's in these partitions will be found so small an amount in comparison with the total cost of the building, that we can only conclude that the failure to provide 2 x 6 studs is due to the fact that their advantages have never been called to

the builder's attention. The extra comfort resulting from the use of the larger studs will more than make up for the small extra cost.

It is, of course, economy in the building of a new house to have the heating contractor set the second and third story stacks in the partitions before the lathing and plastering is done, and as specified in the Code, and in most city ordinances providing for fire prevention, the studs next to the heating stacks should be lined with iron, and metal lath should be used on both sides of the stacks.

As we have seen, it is vital to the successful working of the warm air heating system that an adequate supply of cold air be supplied to the furnace. Just as water must be supplied to a steam boiler before steam can be generated, so cold or cool air must be supplied to the furnace before warm air can be produced. Cold air descends by gravity to the lowest part of the room, where it is drawn into the cold air registers. These registers should preferably be located in the floor, but may be located in the baseboard or under window seats. In the latter case,

however, the cold air register should not be more than 12 inches high and should extend down to the floor line.

Just a word here about the construction of the building itself. Heat is lost through windows and outside doors and outside walls. The type of construction which will reduce the loss through these three parts of the building will result in fuel economy and greater comfort to the occupant.

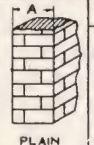



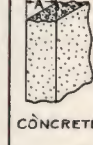


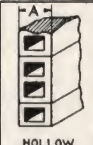














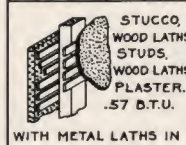
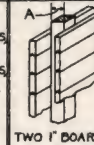
As to window glass, not much can be done except to see that the windows are reasonably tight in the frames, and if possible, they should be weather-stripped. In a very cold climate storm windows are used. The same can be said of the outside doors.

We are showing below the usual types of wall construction with the factor of heat loss (B. T. U.) of each. This information was compiled by the American Society of Heating and Ventilating Engineers. The construction having the smallest loss is, of course, the more desirable from the point of view of heating the building. It will be noted that the thickness of the wall has a great effect on the heat loss.

Heat Transmission from Frame Construction

Construction	B. T. U.
Clapboard on Studs.....	0.62
Clapboard on Studs, Lath and Plaster.....	0.48
Clapboard, Paper, Studs, Lath and Plaster.....	0.34
Clapboard, Studs, 1" Sheathing.....	0.57
Clapboard, Sheathing, Studs, Lath and Plaster.....	0.37
Clapboard, Paper, Sheathing, Studs, Lath and Plaster.....	0.30
Clapboard, Studs, Brick Fill.....	0.40
Clapboard, Studs, Brick Fill, Papered.....	0.36
Clapboard, Studs, Brick Fill, Lath and Plaster.....	0.31
Clapboard, Sheathing, Studs, Lath and Plaster with Sawdust Fill.....	0.21
Clapboard, Paper, Sheathing, Studs, Lath and Plaster with Sawdust Fill.....	0.15

Heat Transmission from Various Types of Wall Construction

 <table> <tr><th>A</th><th>B.T.U.</th></tr> <tr><td>8"</td><td>.38</td></tr> <tr><td>12"</td><td>.29</td></tr> <tr><td>16"</td><td>.25</td></tr> <tr><td>20"</td><td>.22</td></tr> <tr><td>24"</td><td>.19</td></tr> <tr><td>28"</td><td>.17</td></tr> <tr><td>32"</td><td>.15</td></tr> <tr><td>36"</td><td>.14</td></tr> </table> <p>PLAIN BRICK</p>	A	B.T.U.	8"	.38	12"	.29	16"	.25	20"	.22	24"	.19	28"	.17	32"	.15	36"	.14	 <table> <tr><th>A</th><th>B.T.U.</th></tr> <tr><td>8"</td><td>.36</td></tr> <tr><td>12"</td><td>.28</td></tr> <tr><td>16"</td><td>.24</td></tr> <tr><td>20"</td><td>.21</td></tr> <tr><td>24"</td><td>.18</td></tr> <tr><td>28"</td><td>.16</td></tr> <tr><td>32"</td><td>.14</td></tr> <tr><td>36"</td><td>.13</td></tr> </table> <p>BRICK PLASTERED ONE SIDE</p>	A	B.T.U.	8"	.36	12"	.28	16"	.24	20"	.21	24"	.18	28"	.16	32"	.14	36"	.13	 <table> <tr><th>A</th><th>B.T.U.</th></tr> <tr><td>4"</td><td>.30</td></tr> <tr><td>6"</td><td>.27</td></tr> <tr><td>8"</td><td>.23</td></tr> <tr><td>12"</td><td>.18</td></tr> <tr><td>16"</td><td>.13</td></tr> </table> <p>4\" BRICK HOLLOW TILE PLASTERED</p>	A	B.T.U.	4"	.30	6"	.27	8"	.23	12"	.18	16"	.13	 <table> <tr><th>A</th><th>B.T.U.</th></tr> <tr><td>4"</td><td>.24</td></tr> <tr><td>6"</td><td>.22</td></tr> <tr><td>8"</td><td>.20</td></tr> <tr><td>12"</td><td>.17</td></tr> <tr><td>16"</td><td>.11</td></tr> </table> <p>4\" BRICK HOLLOW TILE FURRED, LATHED & PLASTERED</p>	A	B.T.U.	4"	.24	6"	.22	8"	.20	12"	.17	16"	.11	 <table> <tr><th>A</th><th>B.T.U.</th></tr> <tr><td>4"</td><td>0.85</td></tr> <tr><td>6"</td><td>.73</td></tr> <tr><td>8"</td><td>.60</td></tr> <tr><td>10"</td><td>.54</td></tr> <tr><td>12"</td><td>.47</td></tr> <tr><td>16"</td><td>.40</td></tr> <tr><td>20"</td><td>.33</td></tr> </table> <p>CONCRETE</p>	A	B.T.U.	4"	0.85	6"	.73	8"	.60	10"	.54	12"	.47	16"	.40	20"	.33	 <table> <tr><th>A</th><th>B.T.U.</th></tr> <tr><td>4"</td><td>0.80</td></tr> <tr><td>6"</td><td>.71</td></tr> <tr><td>8"</td><td>.57</td></tr> <tr><td>10"</td><td>.52</td></tr> <tr><td>12"</td><td>.45</td></tr> <tr><td>16"</td><td>.38</td></tr> <tr><td>20"</td><td>.32</td></tr> </table> <p>CONCRETE PLASTERED</p>	A	B.T.U.	4"	0.80	6"	.71	8"	.57	10"	.52	12"	.45	16"	.38	20"	.32
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Chimney Requirements

A proper chimney is a necessity for the successful working of any furnace. No furnace of itself has a draft. The draft is supplied solely by the chimney to which the furnace is connected. There is nothing more annoying than a furnace that smokes and this can only be overcome by having it connected to a properly constructed chimney.

The ideal chimney for a furnace is round, two inches in diameter larger than the diameter of the smoke pipe opening on the furnace, plastered perfectly smooth inside and extending from 34 to 40 feet above the grate of the furnace. The next best is a square chimney having its dimensions $1\frac{1}{2}$ to 2 inches larger than the diameter of the smoke pipe opening on the furnace. Another satisfactory chimney is somewhat rectangular, having its smaller dimension at least equal to the diameter of the smoke pipe opening on the furnace and its larger dimension not more than four inches larger than the smaller dimension. In no case should the larger dimension of a rectangular chimney be greater than 150% of the smaller dimension. Every chimney, whether round, square or slightly rectangular, should be perfectly smooth inside, should have no other opening than that for the furnace, should run straight from the smoke pipe opening to the top, and should extend not less than two feet above the highest point of the building to which it is attached or any building or object within 25 feet. It should not extend below the opening where the smoke pipe enters it, except for cleanout, or if it must do so, the remainder of the chimney should be closed off by an airtight partition.

While most of the trouble with chimneys is due to their being too small, a chimney that is too large is just as troublesome. The draft in the chimney is caused by the difference in temperature between the air outside the chimney and that inside. If the chimney is entirely filled with the smoke and hot gases from the furnace, the temperature is very high and the draft is good. If it is only half filled, the temperature is not only lower but the smoke does not entirely fill the chimney, allowing cold air pockets to form which interfere with the draft.

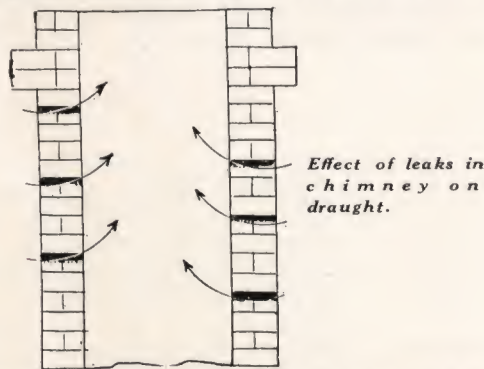
A chimney should be so constructed that no air can leak into it as this also interferes with the

bricks at any point, these points should be repaired.

A chimney in the center of the house is better than one along the outside wall for two reasons. First, there is less chance for the chimney to be chilled and thus lose part of its draft. Second, since the chimney must extend above the highest point on the house, this usually means that on a pitched roof, it must extend unsupported by the walls 10 feet or more in the air. In very windy countries it is often necessary in such cases to run an iron brace from the chimney to the house.

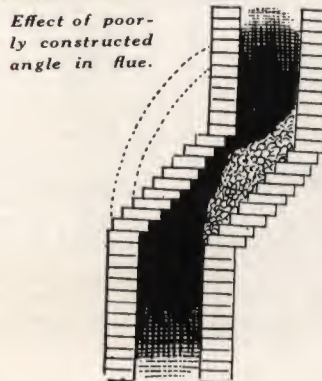
A chimney should not be used as a support for floor joists or inner partitions. Sometimes the floor or the walls settle a few inches and in such case, the chimney would begin to leak.

While the chimney should always run perfectly straight for best results, it is recognized that this is sometimes not possible, or at least not desirable from the standpoint of architecture.

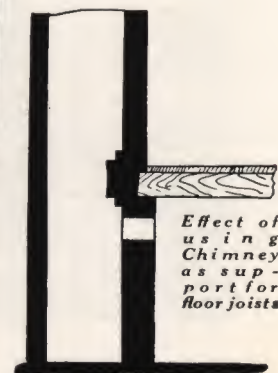


Effect of leaks in chimney on draught.

For instance, a fire place flue may be enclosed in the same chimney as contains the furnace flue, in which case, the furnace flue may have to incline slightly over the fire place before resuming its straight upward travel. In such case the diagonal portion of the chimney should be plastered smooth, so that soot, etc. will not lodge thereon and choke up the opening. It is desirable that the angle of the turn be not more than 30 degrees from perpendicular. Where it is necessary to combine a fire place flue and a furnace flue in the same chimney, there should be, of course, an air-tight partition between them, so they will be in effect two separate chimneys. Under no circumstances should a furnace be connected to the same flue with a fire place.

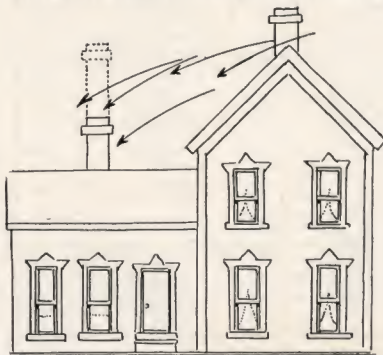


Effect of poorly constructed angle in flue.



Effect of using Chimney as support for floor joists

Effect of Wind on chimney lower than near-by roof.



draft. A simple way to test a chimney is to build a smudge fire inside at the base and cover the top. If smoke is seen escaping between the



The
FRONT RANK
TRADE NAME REGISTERED
THREE PIPE FURNACE



The principal advantages of the three-way pipe over the double casing pipeless furnace are these: It has a long narrow register instead of a square one, which can nearly always be placed in an arch-way or near the wall, making it unnecessary to turn under or cut rugs.

The cold air registers are separate from the warm air and may be moved to another room when desirable.

Other warm air registers can be run to distant rooms, if necessary, much easier than through the double casing.

The hot smoke pipe does not go through the cold air duct as in the double casing type.

The cold air circulation is positive because it is not stopped by coming in contact with the hot inner casing.

The regular pipe casing is used and no special parts are necessary to convert a pipe furnace into a pipeless or vice versa.

LANGENBERG
MANUFACTURING CO.

4519-33 Euclid Avenue

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St. Louis, U. S. A.

(27)

The Pipeless Furnace

There has been so much said about the pipeless furnace, both pro and con, that we are taking this opportunity to describe it to you.

One furnace man will tell you that it is the best system for heating on the market, while another will declare most emphatically that it is no good and never will be. We are going to tell you that it is the best in some cases and the poorest in others.

Like many other articles, the pipeless furnace is designed for particular purposes, and when applied to the purpose for which it is intended, it is satisfactory in every respect.

How it Operates

What you are interested in most is, will it heat your home? Our immediate answer is, it will if your home is so built and arranged that the pipeless furnace will be able to perform all the duties for which it is intended. So we want you to know how the pipeless furnace works, and where it works best.

In the first place, the principle of pipeless heating is not new. Its present appearance is new, but it is nothing more than a development of the warm air furnace used to heat churches, stores and other buildings, the interiors of which are open.

The pipeless furnace heats by circulating warm air throughout the building, just as the pipe furnace does, except that where the latter has a pipe for each room, the pipeless furnace has but one pipe leading to but one room. And instead of cold air registers with pipes leading back to the heater from a distant part of the building, it has the cold air registers and pipes alongside the warm air pipes and casings.

How then, is such a furnace going to heat a house having eight or ten rooms? Just as the center and far parts of a room are heated by a register set near the inner wall—by circulation of heated air from room to room, the warm air going out from the furnace at the same time cold air is coming in to it.

Where It Can Be Used

Houses heated with the pipeless furnaces must have open interiors so that the air can circulate freely from room to room. For example, the house should be about square, and compactly built. The ceilings should be low and the doors wide, or there should be transoms or ventilators near the ceilings and over the doors. If a two-story house, there should be open stairways, or registers connecting the lower and upper rooms. There must be enough openings to permit free circulation of air.

In general then, if you have a home built like the modern one-story or story-and-a-half bungalow, and are willing to leave the doors from room to room open, the pipeless furnace will give you satisfaction; in fact you will get all the benefits of the pipe furnace at a lower cost.

Advantages of the Pipeless Furnace

The pipeless furnace has many advantages over the pipe furnace. It has but one large heat pipe, which results in a minimum loss of heat between the basement and the rooms. Basements are kept cool but not too cool, and there is not the maze of pipes around the basement ceiling that you so frequently find where pipe furnaces are used.

The pipeless furnace is much easier and cheaper to install. One good workman can usually complete the job in a day, while it often requires a week to put in the other.

Because of the one, short lengthed pipe, the warm air reaches the rooms quicker than it does with the pipe furnace. It takes less fuel to start the heat circulating. And you haven't the bother or expense of wrapping the basement pipes to conserve the heat.

If used rightly, the pipeless furnace is always economical and satisfactory.

Will a Pipeless Furnace Heat Your Home?

We have given you an idea of the kind of a house best suited for the pipeless furnace. If you are still in doubt, consult a "FRONT RANK" dealer. He is an expert furnace man, and will be able to tell you whether or not the pipeless furnace is the kind you need. Many of these furnaces fail for the simple reason that they are installed by persons who do not understand the principle of "warm-air heating." The "FRONT RANK" Pipeless Furnace is sold and installed only by expert furnace men. Just as a competent lawyer can give you expert legal advice, so can these dealers give you expert heating advice.

Variations

The usual pipeless furnace sold is the one shown in the illustration on page 27. If you do not like this arrangement, the "FRONT RANK" dealer will offer you the choice of several others. You can have one warm air register in one room, and one or two cold-air registers in another room, thus getting a better air circulation. Or you can have the registers in the wall between the partitions, instead of in the floor. The wall register can either be made to throw all the heat into one room, or into rooms on either side of the partition. And if the bath room is some distance from the heater, and you want the door closed, you can install a separate pipe and register to heat it, or attach a small hot-water radiator, the water being heated by the furnace.

Such installations will cost you a little more, but they are usually worth it from the standpoint of additional comfort and satisfaction.



Why It Is Needed

A heating system, be it an open grate, a stove, a hot air furnace, a steam or hot water system, being an artificial means of creating a climatic condition indoors which does not prevail outdoors, also creates an unnatural condition as regards the amount of moisture that is in the air indoors. Relative humidity outdoors in many states has an average of about seventy per cent (70%).

When you consider that the relative humidity indoors is about thirty per cent (30%) you can readily see that to meet nature's own condition it is necessary to provide an artificial means of supplying to the indoor air a percentage of moisture that will produce as near as possible the natural condition outside.

Why it is a Matter of Health

If the air in our rooms contained more moisture we could live more comfortably at a lower temperature. The over heating and high temperature is required because of the low relative humidity.

Dr. W. M. Wilson of the Weather Bureau in an article entitled "Atmosphere Moisture and Artificial Heating," says:

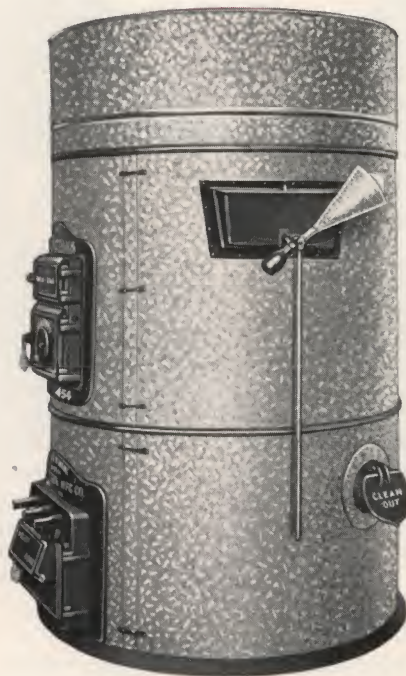
"The evaporation power of the air at a relative humidity of thirty per cent (30%) is

very great, and when the tissues and delicate membranes of the respiratory tract are subjected to this drying process, a corresponding increase of work is placed upon the mucous glands in order to keep the membranes in proper condition.

"Nature in her effort to compensate for the lack of moisture in the air, is obliged to increase the functional activity of the glands, and this increase of activity and the frequent unnatural stimulation, induced by the changing conditions of humidity from the moisture-laden air outside to the arid atmosphere within our dwelling finally results in an enlargement of the gland tissues, on the same principle that constant exercise increases the size of any part of the animal organism.

"Not only do glands become enlarged, but the membrane itself becomes thickened and harsh, and sooner or later the surface is prepared for the reception of the germs of disease, which tend to develop under exposure to the constantly changing percentage humidity.

"Some remarkable cases have come under observation where catarrhal troubles have been relieved and apparently cured by simply introducing sufficient moisture into the air to *bring the conditions to something near normal.*"



What It Is



The "FRONT RANK" Automatic Air Humidifier is, as its name implies, a device by means of which a constant supply of moisture can be diffused in a volume of air.

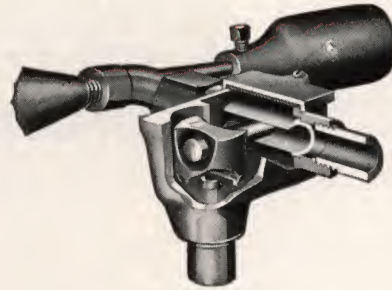
This volume of air which goes into your hot air heating system through the cold air pipe at the rear or underneath is at times quite moist, but at other times quite dry.

This simple device can be attached to almost any water pan and once it has been set to maintain a certain level in the water pan it does not require any further attention.

It consists of a valve, a water weight tank, and a cast iron balance weight.

A short nipple is screwed into the water pan and the valve connected to the nipple. A half inch connection is then run from the bottom of the valve to the house supply. The cast iron balance weight is adjustable so that you can set the valve to shut off at any level desirable. This however, should be about an inch and a half from the top of the water pan.

How It Does It



When the water is turned on, the water pan, and water weight tank, which is the cone shaped piece opposite the cast iron weight, both fill. The port connecting these two is always open. When the weight in the little tank counter-balance the cast iron weight at the other end, the valve commences to close and the addition of a little more water closes it tight.

The water pan being set high in the furnace soon gets warm and as the water boils and vaporizes, the water level is soon reduced.

The water in the water weight tank being the same level as the water in the pan is soon over-balanced by the cast iron weight and this action opens the inlet from the house supply.

The illustration shows the construction of the valve and its extreme simplicity.

By taking off the cast iron weight the water supply is cut off completely, and by simply removing the top plate of the valve a new washer can be inserted at any time with little inconvenience.

During the summer months the valve and water pan may be drained by loosening the lid of the valve body, and the water turned off permanently by removing the cast iron weight.

The valve does not require a float nor a stop cock, and being made of brass does not corrode or get out of order from long usage.

What It Costs

Less than a Doctor's cure for a cold,
Less than the saving alone in coal,
Less than the Specialist's charge for his cures,
Just \$7.00 and it's yours.

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St. Louis, U. S. A.



FRONT RANK

 TRADE NAME REGISTERED

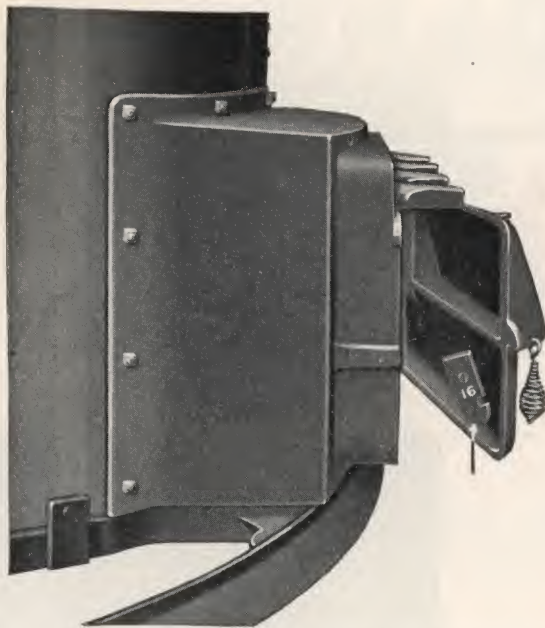
Dealers Installation Manual



Direction for Setting (the "FRONT RANK" Portable Warm Air Furnace.)

1. Select a location for the furnace so that the warm air pipes will be as nearly equal in length as possible.
2. Where there is no granitoid floor, place the furnace on a foundation of brick (one course) laid the flat way. Slush with cement and make tight.
3. Place the base (No. 1) on this foundation. See that no space is left between any part of the base ring and the foundation. If necessary use Portland cement to make it air tight.

4. Set the large drum (No. 2) on the base, fastening with bolts. Use asbestos cement around bottom of drum.
5. Bolt the small slotted castings (No. 3) to the corresponding holes in the rear of the drum. Place flat headed bolts in the dust box rest (No. 4), sliding the bolt heads thru the slots in the castings now attached to the drum, tightening bolts to hold.



The new Ash Pit Pouch showing detachable door catch (indicated by arrow).

6. Bolt the small braces (7a) to the radiators (No. 5). Fasten the radiators (No. 5) to the cast dust box (No. 6) by means of bolts and **PLENTY** of asbestos cement. The radiators should be placed so that the side seams will be towards the center.



Number 11

7. Fasten the small pipe (stand pipe) (No. 7) to the center of dust box in same manner. Bolt the loose end of the braces (7a) to the stand pipe. **CAUTION:** Be sure to set the radiators first, otherwise you cannot reach the bolt holes inside.

8. Fasten the cleanout (No. 8) to the most convenient side of the dust box, and the blank plate (No. 9) to the opposite side, (the smooth side of the plate should be inside) using asbestos cement for collar and plate.

9. Set the dust box, containing the radiators, etc., on the brackets or rests and connect the collars (No. 10) to the corresponding openings in the drum. Use plenty of asbestos cement here and adjust the collars by means of the four long machine bolts drawn thru the lugs or "ears" on the collars. After the dust box is placed, the rests may be adjusted to the proper height and the bolts drawn up tight.

10. Place bottom section of casing Galvanized Iron (24 inches wide) and first casing ring with lugs facing up. Set the grate support (No. 11), in the lugs on ash pit pouch, remove

the front grate rest (13,) place the grate bars, then replace the grate rest (13) and fasten the ash pit door frame (No. 12). To install ash pit door frame, first remove door catch on pouch (16) by removing one bolt. Replace this after frame is in place. Bolt furnace elbow (No. 14) on stand pipe. Use asbestos cement on inside also around ash pit door frame.

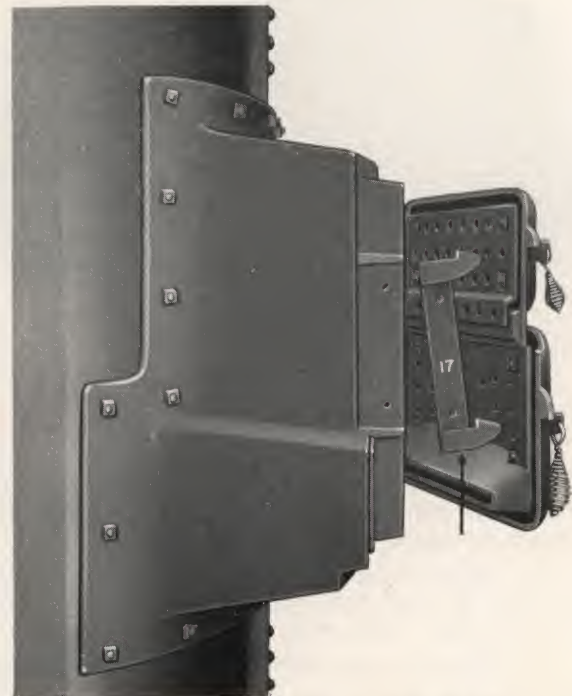
11. Place middle section of casing (double, plain and corrugated galvanized iron) and the second casing ring with lugs facing down, and fasten feed door frame (No. 15.) To install feed door frame, remove door catch on feed pouch (17) by removing two bolts. Replace after frame is in place. Bolt water pan frame in place. This should be located as near top casing ring as possible.

12. Set the hood or canopy (from 12 inches to 24 inches deep according to depth of basement) on the top ring.

13. Place the collars for warm air pipes, keeping tops of same as close to the top of canopy as possible.

14. Make cold air connection, placing the shoe so that cold air will enter as nearly under dust box as possible. If more than one cold air shoe is used, space them evenly around the rear half of the casing.

15. Set the bricks, place the doors, and set water pan in frame.



One piece feed pouch extending beyond casing line. (Showing detachable door catches indicated by arrow)

Suggestions to Furnace Installers.

In our catalog we have omitted altogether the cubic foot capacity of our furnaces. These are unscientific, misleading and often induce estimators to figure on too small a furnace.

Heating requirements of buildings used for different purposes are not the same; one building with say 20,000 cubic feet of space may require a furnace larger than another building of the same size, but used for a different purpose. Climatic conditions and construction also play an important part in determining heat requirements. Therefore, we rate our furnaces according to the amount of heat generated expressed in square inches of cross area of pipes.

The Standard Code Regulating the Installation of Warm Air Furnaces contains the rule for determining the size of pipes, stacks, registers and furnace. Our form for figuring the Standard Code requirements makes it easy to install by the code. These forms will be sent free to Front Rank Dealers.

Below is proper temperature for various rooms as compiled by the Heating and Ventilating Magazine:

Living Rooms.....	70
Vestibules or Entrance Halls.....	54 to 60
Bath Rooms.....	70 to 85
Churches.....	65
Factories.....	65
Hospitals.....	72 to 75
Operating Rooms.....	70 to 90
Offices.....	68
Public Buildings.....	68 to 72
Schools.....	70

For determining the lowest temperatures to be met, the following considerations are suggested:

The building may be exposed to cold winds when set on a prominent elevation, or it may be in a sheltered position and protected by hills, forest or a nearby building.

The temperature range in a given locality may reach the extreme for a long and continued period of time, or it may reach the extreme but rarely, and then for a brief interval of hours only.

In a locality which goes down to zero only once in two or three years and the zero weather lasts only a half day or less, you can safely figure for five degrees or even ten degrees above zero, but for a locality which goes down to five degrees above and hovers around such a temperature for a week or more, you would be much wiser to figure it as zero.

The Heating of Churches, etc.

In heating any space, the temperature of the air will not be maintained until every article in the room is heated to the temperature required in the room.

For that reason churches and other buildings which are heated only once a week and then allowed to become cold require considerably longer to warm than a residence where the temperature, even at night, seldom gets below 50. However, in practice the janitor or other person tending a church furnace seldom allows sufficient time to secure the proper degree of heat before services begin and, therefore, we recommend using a furnace at least one size larger than the pipe area required indicates.

Wall Pipe and Fittings

All tests made indicate that double air cooled wall pipe is superior to single wall pipe, either covered with asbestos paper or not. Although somewhat smaller in area than the single pipes, the insulation caused by the double wall keeps the heat within the pipe so that there is less heat loss than thru the single pipes.

Standard boots or foot pieces, either single or double, shown in our fitting catalog, are so designed as to reduce friction to the minimum. A great deal of trouble will be overcome by their use.

Cold Air Supply

A steel furnace, such as the "FRONT RANK" generates heat so rapidly and the heat penetrates the steel plates so quickly, that it is essential that the cold air supply be ample at all times. Never use a cold air supply less than the combined area of all the warm air pipes when taking inside or recirculated air. When taking outside air, an allowance may be made for the fact that the outside air, being colder than the inside air, expands to a certain degree. Therefore, in using outside air, a capacity of approximately 80 per cent of the total capacity of the warm air pipes is permissible.

We recommend using standard cold air shoes, such as are listed in our fitting catalog.

We do not recommend the use of dampers in cold air pipe. Where both inside and outside air is used, we provide what is called a "fool proof" damper. It is one which closes only one pipe at a time, leaving the other open.

When boxing under joists or in using square pipe, be sure that the area of this part of the cold air duct is equal **at all points** to the round pipe leading to the furnace, to which it is connected.

In using cold air register, either wood or steel, it is customary to box the joists under the register, and nail a ceiling plate with collar to the bottom of the joists; thus avoiding cutting the joists. Care should be taken to see that all portions of the cold air register will convey air to the round collar. For example, in using a long narrow register with a collar at only one end of the flange, it may be necessary to frame with wood under the joists before nailing on flange so that air can flow from the far end of the register.

Registers

It is not our place to recommend any particular type or make of registers. We handle standard makes and the catalog of each manufacturer sets forth his claims to superiority.

We do believe, however, that the use of baseboard registers has many advantages over floor registers, both from the point of view of neatness, and also because they are cleaner.

Side wall or baseboard cold air faces may also be used, but care must be taken to make them narrow and long rather than high and short. A cold air register more than 12 inches high is not satisfactory beyond that height.

Engineering Service

These general directions, we believe, will enable the furnace installer to meet the average job in making a complete and successful installation. Our Engineering Department stands ready to assist you in laying out any plans and also to estimate the job, if wanted. Send us the blue prints or a rough sketch on the forms which we provide. (See also page 39)

On Figuring Jobs

In figuring jobs, we recommend having a printed form, listing all the items necessary to complete a furnace job so that you will not omit certain items.

The form used by us is one of the most complete in existence. We will gladly furnish these forms free of charge to "FRONT RANK" dealers.

SUMMARY OF WARM AIR HEATING SYSTEM DEFECTS

The Most Frequently Encountered, and Their Correction

INSUFFICIENT HEATING

I. *Insufficient Heat Generated in the Furnace.*

A. Poor draft, continuous condition.

1. Other than new installations.

- a. Excessive accumulation of ashes in ash pit.
- b. Clinkers or too many ashes in the fuel bed.
- c. Radiator or flues of furnace clogged or obstructed.
- d. The above condition as applied to the smoke pipe—smoke pipe too small so that it clogs quickly.
- e. Flue connections into smoke pipe left open.
- f. End of smoke pipe has been pushed into chimney flue.
- g. Smoke pipe rusted through.
- h. Chimney clogged with soot and dirt, or other obstructions in flue caused by the breaking up of masonry—bricks, etc.
- i. Opened flue connections into the chimney flue into which the smoke pipe is connected.
- j. Poor internal shape of chimney flue causing rapid clogging.

- k. Higher buildings recently erected which influence wind currents so as to produce a down draft in the chimney.

- l. Deterioration of chimney walls making them leaky and inefficient.

- m. Continued use of a poor quality of fuel.

2. New Installations

- a. Materials or obstructions left in the furnace flues or smoke pipe due to carelessness of workmen.
- b. Connection of open flues into the smoke pipe.
- c. Smoke pipe too long.
- d. Smoke pipe pitches down instead of up.
- e. Smoke pipe too small.
- f. Smoke pipe projects into the chimney flue.
- g. Materials and obstructions left in the chimney flue.
- h. Connection of open flues into the chimney.
- i. Openings actually left in the chimney wall by the mason.
- j. Cross-sectional area of the chimney flue too small.
- k. Poor internal proportions of the chimney flue dimensions.

1. Chimney is not high enough.
- m. Chimney poorly constructed, being leaky and having rough joints inside.
- B. Furnace Smoking into Basement.
 1. Obstructions in flue system.
 2. Drafts not regulated properly while firing.
- C. Poor Draft and smoking at times only.
 1. Usually due to wind.
 - a. Action on building itself.
 - b. Action of surrounding buildings.
 2. Correction of condition
 - a. Chimney height increased.
 - b. Special chimney top flue outlet.
- D. Furnace too small
 1. If draft satisfactory.
 2. And furnace casing not excessively warm.
 3. Then heat loss of house must be checked.
- II. **Insufficient heat delivered.** Usually indicated by hot casing and high basement temperature.
 - A. Insufficient cold air supply.
 1. Cold air passage hampered.
 - a. Cross-sectional area of duct too small.
 - I. Recirculating duct must be same area as total W. A. Pipes.
 - II. Outside air 80% of Warm Air Pipe area.
 - b. Poor design, sharp bends, etc.
 - c. Obstructions.
 - I. Joist braces in ceiling ducts.
 - II. Cloth screens.
 - III. Leaves, etc. against outside air screens.
 - d. Cold air duct connected to casing at too high a level.
 - I. Cold air is choked back.
 - II. Top of C. A. duct should not be located much above level of grate.
 - e. Auxiliary heaters connected into casing.
 - A. Slow up circulation like a check damper.
 - f. Basement air supply. (Not good at best).
 - I. Opening too small.
 - II. Slide not opened wide.
 - III. No access of air to opening.
 - B. Distributing system not adequate.
 1. Leader dampers not opened full.

2. Leaders do not have enough pitch (1" to running foot).
3. Fittings installed poorly, of poor proportions, or insufficient size.
4. Insufficient free area in register faces.
5. Distributing system too small.
6. System must be checked against heat loss.

UNEVEN HEAT DISTRIBUTION

- A. Continuous
 1. Leader pipe has insufficient cross sectional area for the heat loss of the room.
 2. Same condition existing for the wall pipe and register face free area.
 3. Leader has not the required pitch.
 4. Leader is exceptionally long.
 5. Leader connected to the casing at the "dead area" (directly above the feed chute).
 6. Poor type of connection between leader and wall pipe or stack head.
 7. Wall pipe, in order to have proper area has poor internal proportions.
 8. Two or more outlets served from an inadequate leader and wall pipe, with or without the use of offsets and horizontal runs between floors.
 9. Leaders lead to outside walls and there connect with stack heads or wall pipes.
 10. Extremely poor building construction.
- B. Condition present at times only.
 1. Poor building construction.
 2. Poor design of warm air pipe line.
 3. Insufficient internal area of warm air pipe line.
 4. Insufficient cold air supply.
- C. Uneven heat within one or more rooms.
 1. Poor building construction.
 2. Poor design of warm air pipe line.

UNSANITARY HEAT

- I. Low humidity. Relative humidity should be 40%.
- II. Smoking into casing.
 - A. Joints open—furnace must be reset.
 - B. Cracking or rusting through of sections of the furnace.

HEATING SYSTEM UNCLEAN

- I. Leak between heater and casing.
- II. System has never been cleaned.
- III. Sweeping or cleaning with windows shut.
- IV. Insufficient humidity.

FREE ELECTROTYPES

FOR OUR DEALERS

A Complete Newspaper Campaign for Spring, Summer and Fall to Advertise Your Business Sent Free on Request.



Think of Winter N-O-W

Start now to get your business ready for winter. Don't wait until the cold weather comes and you are rushed with family-work. Think ahead—toward the health of your family—avoid delay, disappointment and inconvenience—NOW so that it will be ready to fight the winter you need it. We are heating experts—we repair all kinds of furnaces—and do it right.

Now Is The Time To Have Your Furnace Put in Shape for Winter

Don't wait till cold weather comes and you are rushed with family-work. Think ahead—toward the health of your family—avoid delay, disappointment and inconvenience—NOW so that it will be ready to fight the winter you need it. We are heating experts—we repair all kinds of furnaces—and do it right.

We are exclusive agents in this city for the **FRONT RANK STEEL FURNACE**

If you are still working along with old-style heating stoves, now would be a good time to figure on installing a modern heating plant. Get a Front Rank and you will have a warm, comfortable home next winter and you will save work, fuel and expense. Let us talk it over.

YOUR NAME HERE

Your Address Here Phone Number Here

Guttering, Spouting, Metal Work, Furnace Repairs



"Send the Furnace Man"

Say "Now Instead of Later"

If you don't clear it up now, it will be a big problem later.

HEAT THE WHOLE HOUSE

It Means Health and Comfort for Your Family

A stove may heat one room—but it takes a Front Rank to keep the entire house cozy and comfortable. Think what it will mean for the health and comfort of your family to have the living room, bed room, hall, bath room—all the same even temperature.

For economy and satisfaction, there is nothing like a **FRONT RANK STEEL FURNACE**

Whether you are building a new home or changing the heating system in your old house—let us interest you in the many superior features of the Front Rank. Easily installed in new or old homes. Assures constant supply of fresh, moist, circulating warm air—day after day in the fuel it saves. Let us show you the Front Rank.

YOUR NAME HERE

Your Address Here Phone Number Here

Guttering, Spouting, Metal Work, Furnace Repairs



Guttering Spouting Metal Ceilings Furnace Work

We work for you or for your business by doing good prompt service. Let us show you how we can help you.

Get Our Figures on your next job

You'll like the kind of work we do—and our prices fair and reasonable. Try us on your next job.

We recommend, install and guarantee the **FRONT RANK STEEL FURNACE**

The Front Rank is positively the best furnace you can buy. Not a pot-bellied furnace, but a pipe furnace that will keep all your rooms comfortable in the coldest weather—ordinary are will last as long as the house. Let us show you the Front Rank and explain its many points of superiority.

YOUR NAME HERE

Your Address Here Phone Number Here

Guttering, Spouting, Metal Work, Furnace Repairs

These are small reproductions of the cuts we furnish. They measure two newspaper columns wide by 6 1/2 inches. This is 13 column inches or 182 agate lines.

For Every Home



Do you want real heating comfort? Let us explain to you the gas-tight, dust-proof, fuel-saving, boiler-plate construction of Front Rank furnaces. They assure plenty heat and make the coal pile last longer.



"Good Bye! We're Going Home—Front Rank is too Hot!"

This is 2 columns wide 2 inches deep—4 column inches or 56 agate lines. The electro to the right is 1 column wide by 4 inches deep, also 4 column inches. Both cost the same in your newspaper. We suggest they be run in between the bigger ads as they are too small to attract sufficient attention when run alone. On pages 37 and 38 are cuts of the furnace which may be used in your advertising in case the ads shown above do not fit in with your own campaign. Our advertising department will gladly co-operate with you in constructing advertising campaigns for any particular purpose.

For Every Home



A Front Rank furnace will give you an abundance of heat, all winter long—healthful, moist air, constantly circulated.

FRONT RANK STEEL FURNACES

Get all the heat out of your coal! See us for details of Front Rank gas-tight, dust-proof, fuel-saving, boiler-plate construction.

This is One of the Six



**"Send the
Furnace
Man"**

Say It Now Instead of Later

If you want your furnace to be ready for business the moment cold weather comes, you should have it inspected, cleaned and repaired NOW, while we have the time to do it promptly and thoroughly. We clean and repair any type of furnace—anywhere in the city—and do it at reasonable prices. Phone us today—now—and get it off your mind.

*We recommend,
install and
guarantee the*

FRONT RANK
TRADE NAME REGISTERED
STEEL FURNACE



The furnace with a reputation—over 25,000 in use—and every one giving the best of service and satisfaction. The Front Rank is a pipe furnace (not a pipeless) — carries heat equally to every room—ventilates and humidifies the air at the same time. Let us show you the Front Rank with its many superior features.

Exact size of one of the series of six ready to run newspaper electros which hundreds of FRONT RANK dealers run every year with great success.

Once you adopt a trade-mark or a special style of type, always use it so folks will recognize it when they see it. We always spell our trade name **FRONT RANK** in this special type. You may use this on letter heads or in advertising.

Size 1 **FRONT RANK**
TRADE NAME REGISTERED

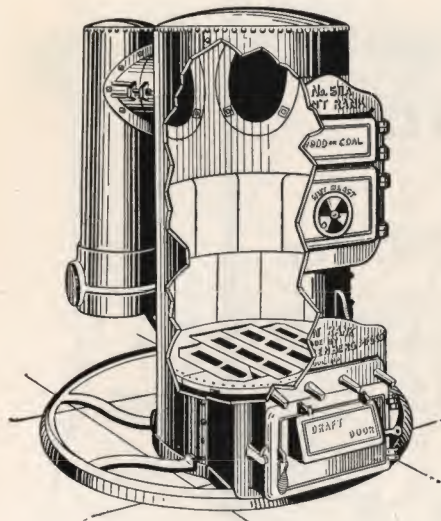
Size 2 **FRONT RANK**
TRADE NAME REGISTERED

Size 3 **FRONT RANK**
TRADE NAME REGISTERED

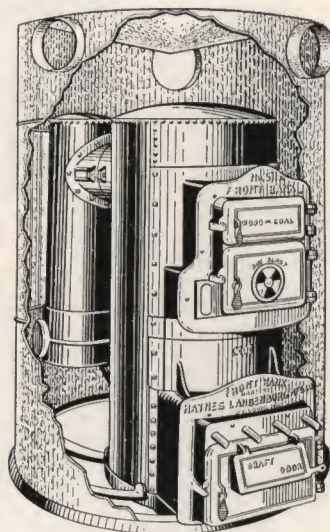
Size 4 **FRONT RANK**
TRADE NAME REGISTERED

Size 5 **FRONT RANK**
TRADE NAME REGISTERED

Free Electrotypes For Our Dealers



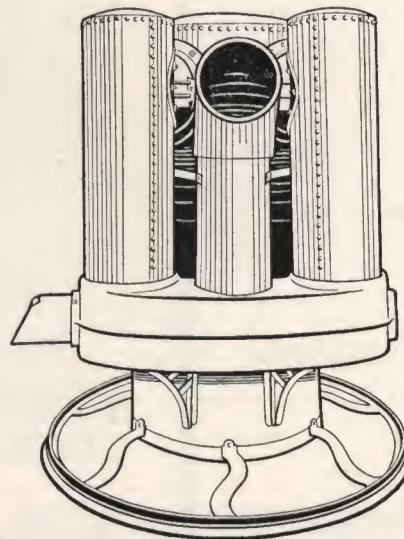
Cut No. 1-B illustrated above. Same picture furnished two inches high - Cut No. 3-B; and 1½ inches high - Cut No. 10-B.



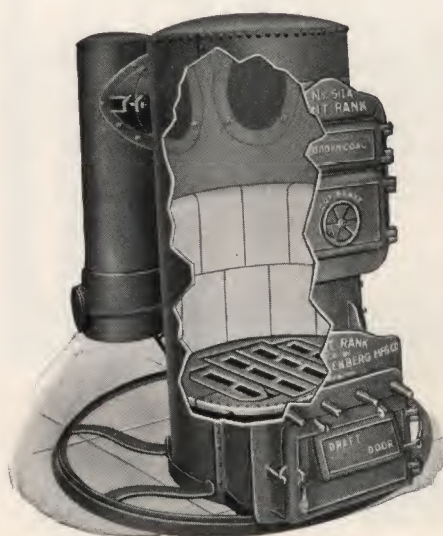
Cut 12-B illustrated above. Same picture furnished 2 inches high - Cut 5-B; and 1½ inches high - Cut 13-B.



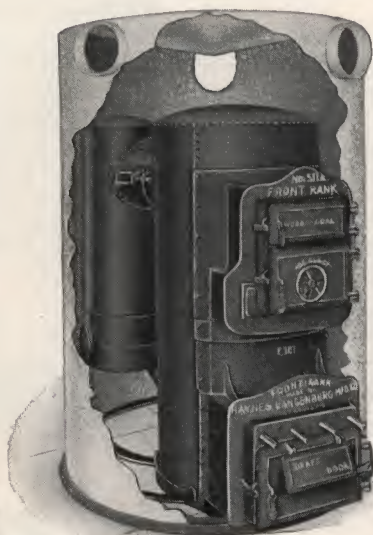
Trade mark cut furnished in one or two colors.



Cut No. 8-A.



Cut 2-B. Same picture furnished 2 inches high - Cut 7-B; and 1½ inches high - Cut 9-B.



Cut 4-B illustrated above. Same picture furnished 2 inches high - Cut 15-B; and 1½ inches high - Cut 14-B.



Cut No. 6-A.

In ordering any cuts, please order by number.

Estimates

That we may make an intelligent and accurate layout and proposal to meet your needs, it is necessary for us to have the following information. Please be explicit.

DIMENSIONS OF BUILDINGS

Dimensions of Rooms

Type of Construction

Glass Area

Location of Flue

Size of Flue and Height

Space available for heating plant

Points of the Compass

What is building used for

Write your own guarantee of temperatures desired.

If possible, send blue prints or rough sketches. They will be returned to you promptly.

Every effort will be made by us to please you. We are here to stay, because we do our best to serve you.

Consultation, estimates and any information on Air Heating Systems is our specialty and users are urged to avail themselves of this gratis service.

Additional Dimensions of Front Rank, 3 Pipe Systems

(See pages 27 and 28 also next page)

No. of Furnace	Diameter of W. A. Pipe	Diameter each of C. A. Pipe	Size W. A. Register (floor type)	Size each C. A. Register (floor type)	Heating Capacity, cu. ft.	Heating Capacity Rooms	Shipping Weight, complete about
381	22	16	24x24	12x24	10 to 12M	4 or 5	1210 lbs.
454	24	18	26x26	14x26	16 to 17M	6 or 7	1400 lbs.
514	28	20	30x30	16x30	19 to 21M	8 to 10	1700 lbs.
574	30	22	30x36	16x36	22 to 25M	11 to 12	2100 lbs.
601	32	24	36x36	18x36	25 to 30M	Church	2400 lbs.

Each 3-pipe unit consists of: 16" W. A. pipe, 8' C. A. pipe, two 4-pc. C. A. elbows adj., four 2-pc. C. A. elbows adj., two C. A. ceiling plates with collars, one W. A. register box with

collar, one W. A. draw band, two C. A. draw bands, two C. A. side collars, one W. A. register face B. J., two C. A. register faces B. J.

Above material sufficient for 8' basement (floor to floor) with register set as in cuts. If registers are placed at a distance from furnace, add necessary pipe and angles.

All furnaces include, without extra charge, poker, scraper, shaker handle, chain regulator outfit, and check draft and smoke pipe damper.

Note: The capacities shown in this table are accurate. In figuring cu. ft. capacity, figure outside dimensions and total height of building. If hip roof, average height. In counting rooms consider each hall as a room, large living rooms extending across front of house as two rooms.

Dimensions of Front Rank Steel Furnaces

No. of Furnace	Diameter of Casing	Diameter of Drum	Height of Drum	Diam. of Fire Pot (Inside Tile)	Depth of Fire Pot	Diameter of Radiators	Height of Radiators	Hght. of Furnace over all not less than (see note 1)	Diameter of Smoke Pipe	Distance from floor to bottom of smoke pipe	Size of Feed Door Opening	Depth of Ash Pit	Size of Ash Pit Opening	Capcy. in sq. in. of cross area of Hot Air Pipes (see note 2)	Shipping Weight less Casing
381-384	38"	18"	58"	16"	13 $\frac{1}{2}$ "	9"	37"	66"	8"	44 $\frac{1}{2}$ "	10x12"	12"	8 $\frac{1}{4}$ x11 $\frac{1}{2}$ "	350	750 lbs.
454	45"	22"	58"	20"	15"	10"	34"	68"	9"	42 $\frac{1}{2}$ "	12x13 $\frac{1}{2}$ "	14"	10 x16"	500	1000 "
514	51"	26"	59"	23"	15"	11"	35"	70"	9"	44 $\frac{1}{2}$ "	12x13 $\frac{1}{2}$ "	14"	10 x16"	675	1200 "
574	57"	29"	62"	26"	15"	13"	38"	70"	10"	43 $\frac{1}{2}$ "	12x13 $\frac{1}{2}$ "	14"	10 $\frac{1}{2}$ x17 $\frac{1}{2}$ "	875	1450 "
601-604	60"	32"	62"	29"	15"	15"	38"	72"	10"	44"	12x13 $\frac{1}{2}$ "	14"	10 $\frac{1}{2}$ x17 $\frac{1}{2}$ "	950	1650 "
661-664	66"	32"	69"	29"	15"	18"	42"	78"	10"	45 $\frac{3}{4}$ "	12x13 $\frac{1}{2}$ "	14"	10 $\frac{1}{2}$ x17 $\frac{1}{2}$ "	1100	1800 "
661-H 664-F	66"	32"	90 $\frac{1}{2}$ "	29"	19"	18"	58"	110"	10"	49 $\frac{1}{4}$ "	12x13 $\frac{1}{2}$ "	14"	10 $\frac{1}{2}$ x17 $\frac{1}{2}$ "	1300	2000 "

CASING MEASUREMENTS "FRONT RANK"

Furnace	Stretch-out	Width	Description
381-384	9 ft. 11 $\frac{1}{8}$ in.	23 in.	Lower Section
	9 ft. 11 $\frac{1}{8}$ in.	30 "	Middle Section
	9 ft. 11 $\frac{1}{8}$ in.	12 "	Canopy not less than
454	11 ft. 9 $\frac{3}{8}$ in.	24 "	Lower Section
	11 ft. 9 $\frac{3}{8}$ in.	30 "	Middle Section
	11 ft. 9 $\frac{3}{8}$ in.	14 "	Canopy not less than
514	13 ft. 4 $\frac{1}{8}$ in.	24 "	Lower Section
	13 ft. 4 $\frac{1}{8}$ in.	30 "	Middle Section
	13 ft. 4 $\frac{1}{8}$ in.	16 "	Canopy not less than
574	14 ft. 11 $\frac{1}{4}$ in.	24 "	Lower Section
	14 ft. 11 $\frac{1}{4}$ in.	30 "	Middle Section
	14 ft. 11 $\frac{1}{4}$ in.	18 "	Canopy not less than
601-604	15 ft. 8 $\frac{1}{8}$ in.	24 "	Lower Section
	15 ft. 8 $\frac{1}{8}$ in.	30 "	Middle Section
	15 ft. 8 $\frac{1}{8}$ in.	18 "	Canopy not less than
661-664	17 ft. 1 $\frac{3}{8}$ in.	26 "	Lower Section
	17 ft. 1 $\frac{3}{8}$ in.	36 "	Middle Section
	17 ft. 1 $\frac{3}{8}$ in.	24 "	Canopy not less than
661-H 664-F	17 ft. 1 $\frac{3}{8}$ in.	30 "	Lower Section
	17 ft. 1 $\frac{3}{8}$ in.	36 "	Middle Section
	17 ft. 1 $\frac{3}{8}$ in.	24 "	Upper Section
	17 ft. 1 $\frac{3}{8}$ in.	24 "	Canopy not less than

Note 1. Lowest point of canopy must be at least 8" above drum head.

Note 2. These are for use in connection with Standard Code.

Table Showing Net Capacities of Registers

Size of Opening	Capacity Sq. In.
8x10	53
9x12	72
10x12	80
10x14	93
12x15	120
14x18	168
14x20	187
16x18	192
16x20	213
16x24	216

Seam laps not included on above measurements.

Table of Capacities and Dimensions of Chimney Flues

Diameter of Furnace Smoke Pipe	Size of Chimney Flue Inside			Proper Inside Dim. of Stan. Flue Linings	Proper Height of Chimney Above Grate
	Proper Diameter Round Chimney	Proper Size of Unlined Square Chimney	Proper Size of Unlined Rectangular Chimney		
8 in.	10 in.	9 $\frac{1}{2}$ x 9 $\frac{1}{2}$ in.	8x12 in.	7 x11 $\frac{1}{2}$	34 ft.
9 "	11 "	10 $\frac{1}{2}$ x10 $\frac{1}{2}$ "	10x12 "	7 x11 $\frac{1}{2}$	36 "
10 "	12 "	11 $\frac{1}{2}$ x11 $\frac{1}{2}$ "	10x14 "	11 $\frac{1}{4}$ x11 $\frac{1}{4}$	38 "
12 "	14 "	13 $\frac{1}{2}$ x13 $\frac{1}{2}$ "	12x16 "	11 $\frac{1}{4}$ x16 $\frac{1}{4}$	40 "
14 "	16 "	15 $\frac{1}{2}$ x15 $\frac{1}{2}$ "	14x18 "	15 $\frac{3}{4}$ x15 $\frac{3}{4}$	40 "
15 "	17 "	16 $\frac{1}{2}$ x16 $\frac{1}{2}$ "	14x20 "	17 $\frac{1}{4}$ x17 $\frac{1}{4}$	40 "

Flue dimensions where two connections are made to the same flue

2 - 8 in.	14 in.	13 $\frac{1}{2}$ x13 $\frac{1}{2}$ in.	12x16 in.	11 $\frac{1}{4}$ x16 $\frac{1}{4}$	40 ft.
2 - 9 "	15 "	14 $\frac{1}{2}$ x14 $\frac{1}{2}$ "	14x16 "	15 $\frac{3}{4}$ x15 $\frac{3}{4}$	40 "
2 - 10 "	16 "	15 $\frac{1}{2}$ x15 $\frac{1}{2}$ "	14x18 "	15 $\frac{3}{4}$ x15 $\frac{3}{4}$	40 "

The above sizes are the correct ones to use in **new construction**. They will make the FRONT RANK Furnace deliver its fullest efficiency.

Take this up with the owner, contractor or architect **before** the flue is built. It will save many difficulties.

Table Showing Areas of Round Pipe

Diam. of Pipe	Area in Sq. In.
8 in.	50
9 "	63
10 "	78
12 "	113
14 "	154
16 "	201
18 "	254
20 "	314
22 "	380
24 "	452
26 "	531
28 "	616
30 "	707
32 "	804
34 "	907
36 "	1018

